SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. L.—No. 15. [NEW SERIES.] NEW YORK, APRIL 12, 1884. [$3.20 per Annum. [POSTAGE PREPAID.]

INCREASING THE BRIDGE FACILITIES.

In our issue of October 13, 1883, we described and fully illustrated the arrangements for switching cars at the New York terminus of the bridge. It will be remembered that motion was transmitted to two grip cars permanently attached to two auxiliary ropes passed around drums which were actuated by the main cable. These drums were provided with friction clutches that were operated by levers located upon a platform in the center of the building. One grip car passed up to the end of the incoming track; the other crossed the switch, and passed to the end of the outgoing track. By either of these grips the passenger cars were hauled to the end of the station, whence they were allowed to run to the platform alongside of the outgoing track.

This system has now been in operation since last September, and has proved adequate and reliable, transferring the cars from one track to the other quickly and with a most gratifying freedom from noise. But, although the method gave most satisfactory results, it soon became apparent that much more extended track room was necessary for switching purposes, in order that more cars could be shifted simultaneously during the periods of greatest travel. As the tracks are now laid out, only two cars can be switched at the same time. On the south, or down town, track, the distance from the end of the switch to the end of the track is 107 feet; on the north track the distance between the same points is 101 feet; the difference being due to the angle which the bridge makes with Chatham Street. The large cars are 48 feet long, the small ones 36 feet, and the grip cars 8½ feet, so that a train made up of a long and short car and the grip is 92½ feet in length.

At a recent meeting, the trustees of the bridge adopted plans for a structure to extend from the end of the bridge across the space formed by the junction of Chatham and Center Streets to the building line on the latter street; and from these plans the accompanying engraving was made, representing the extension as it will appear when viewed from a point just south of the Hall of Records. Under the conditions governing an undertaking like this it is impossible to make a system of tracks, girders, and columns a thing of beauty and a welcome ornament to a neighborhood; but these plans contemplate a structure which, while serving all the purposes for which it was designed, will be as unobtrusive as possible, and which is one of the best, if not the best, that could be built when considered simply and solely from a utilitarian point.

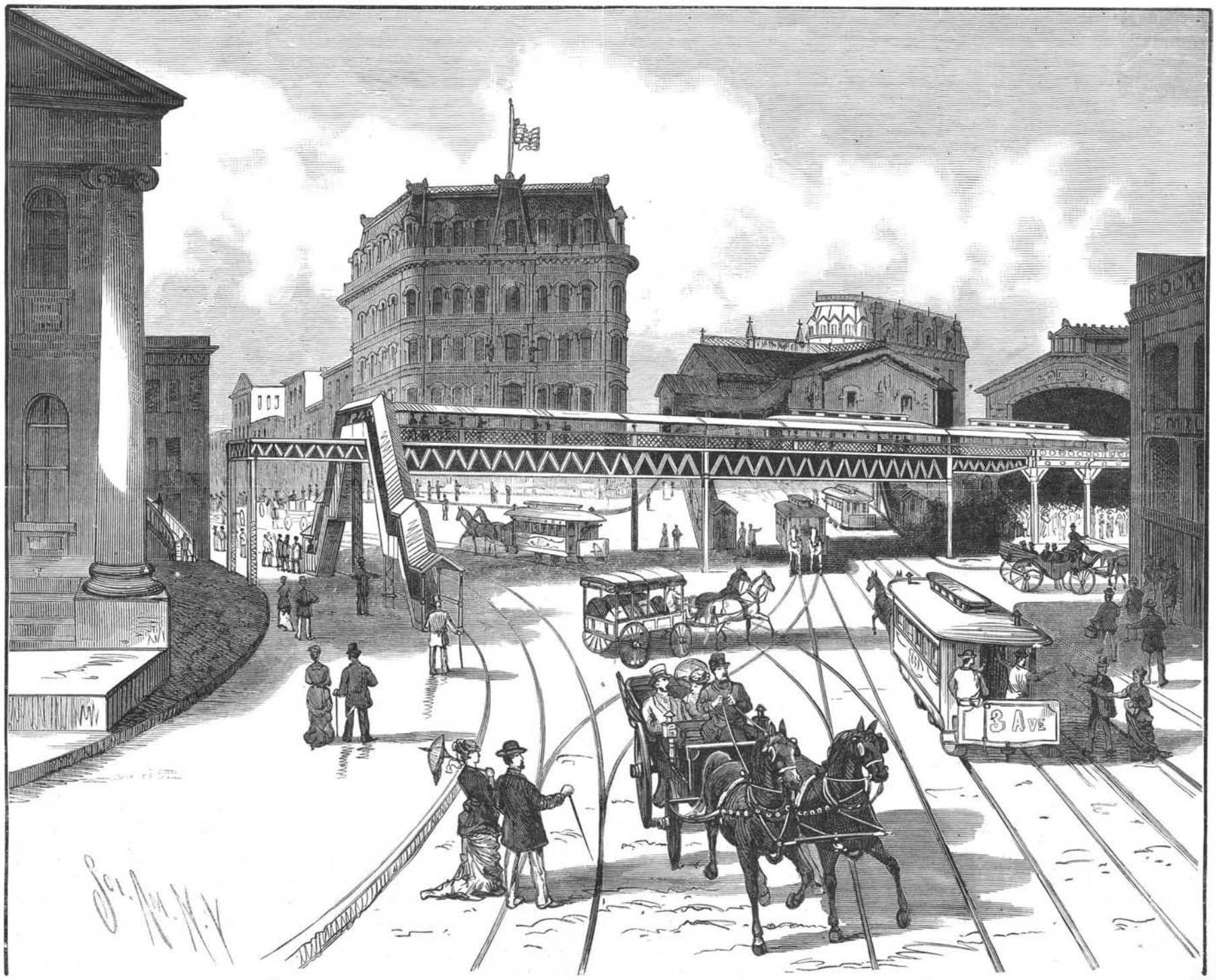
There will be four cross girders: one at the curb line of Chatham Street, one at the curb and one at the building line of Center Street, and one near the center of the crossing. The latter will be perpendicular to the line of the bridge, while the others will be parallel to the streets on which they will be located. Each girder will be supported by two end columns. Upon these will rest eight lines of longitudinal latticed girders, placed 5 feet 7⅞ inches between centers; the distance between the centers of the outside girders will be 39 feet 7 inches. The girders will be 4 feet deep; flange plates, 12″x½″x⅝″; chord angles, 4″x3½″x$\frac{9}{16}$″; web plates, 10½″x⅝″; diameter of rivets, ⅞″. The top chord will be made up of two angles, with a plate between, and on top of which, for the entire length, will be two plates, increased to three in the middle section. The girders will be tied together and braced. The distance from the end of the car platform of the bridge station to the first row of columns will be 26 feet; the south girder, extending from this row of columns to the center row, will be 45 feet long; the north girder 64 feet 5¼ inches; the south and north girders from the center to the Center Street curb will be 56 and 63 feet; the girders over Center Street sidewalk will be 18 feet. The height from the street to the bottom of the lower chord will be 15 feet.

Two flights of stairs, one upon each side, will lead from the Center Street sidewalk to this platform, thereby allowing passengers from the west of the City Hall to enter the bridge without passing through the moving crowds of cars, wagons, and people in the street. These walks will be covered by an umbrella work similar to those over the platform extensions at the Brooklyn station.

This plan will necessitate cutting off one corner of the elevated railroad station. The stairway leading to the station will be moved from its present position up to a point about on the center line of the bridge, thereby relieving the southern carriageway. The stairway in the center of the street will be turned around so as to approach the station from the down town side. Platforms will connect the bridge with the railroad station, so that passengers going in either direction will not be compelled to descend to the street.

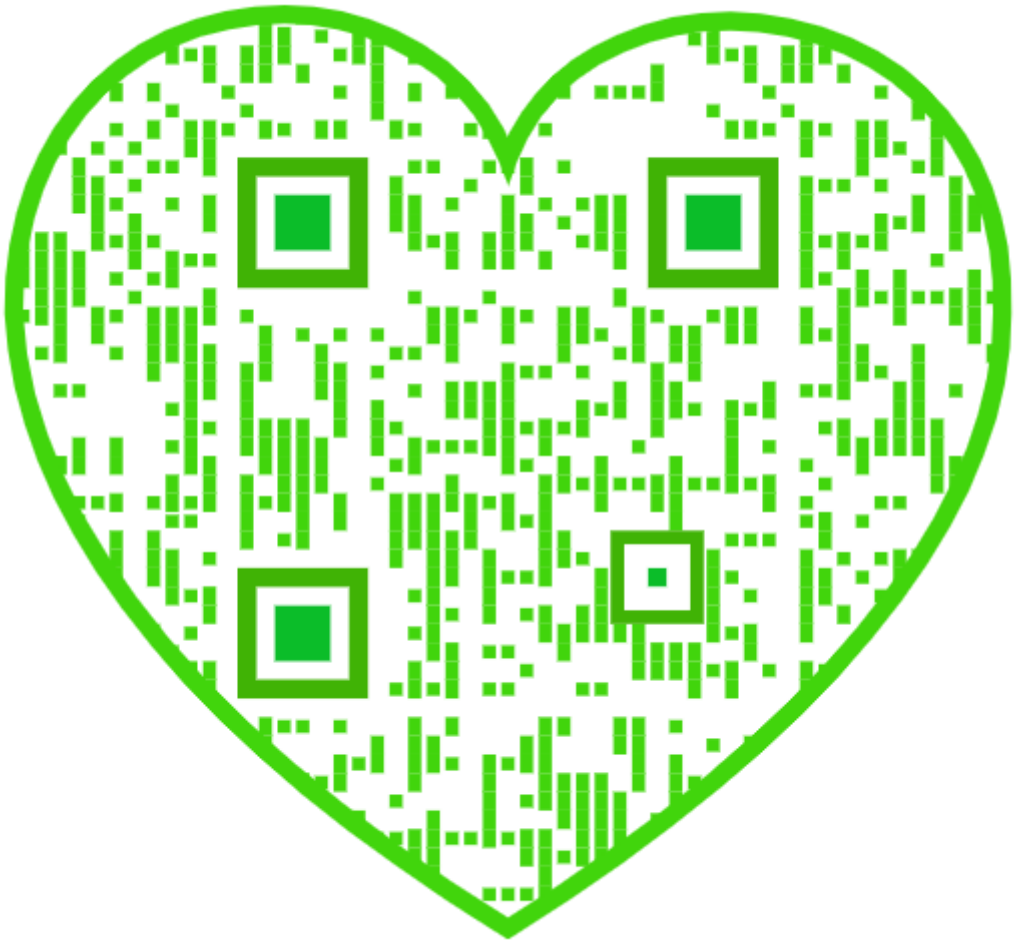
At present it is the design to extend the bridge tracks only to the center row of columns; the increased switching room thus obtained will be about 80 feet. This will give tracks about 190 feet long from the switches to the bumpers, and will allow trains of four cars to be easily handled. The auxiliary ropes can be arranged to do this work, but it is probable that a method (by engines) similar to the one now used at the Brooklyn terminus will be adopted.

The structure will be of ample strength to sustain travel if, at any future time, the bridge should be connected with a west side system of railroads.



VIEW SHOWING THE PROPOSED IMPROVEMENT AT THE NEW YORK TERMINUS OF THE BROOKLYN BRIDGE.

© 1884 SCIENTIFIC AMERICAN, INC



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... $3 20
One copy, six months postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 361 Broadway, corner of Franklin street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft, postal order, or registered letter. Address MUNN & CO., 361 Broadway, corner of Franklin street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 361 Broadway, corner of Franklin street, New York.

NEW YORK, SATURDAY, APRIL 12, 1884.

REMOVAL.

The SCIENTIFIC AMERICAN Office is now located at 361 Broadway, cor. Franklin St.

Contents.

(Illustrated articles are marked with an asterisk.)

Act, patent, a novel	229	Leather, glucose in	230
Air	227	Locality, ideas of	228
Alcohol and digestion	228	Magnetism, theory of	231
Belting, leather	229	New books and publications	233
Boilers, power of	227	Notes and queries	233, 234, 235
Bridge, Brooklyn, N. Y. terminus*	223	Oiler, valve, improved*	226
Bridge facilities, increasing*	223	Panclastite*	227
Business and personal	233	Patents in Congress	224
Clouds, Central France under*	231	Pencils, lead	226
Coal, efficiency of	226	Planter, corn*	226
Cooper, Peter, anecdote of	227	Post, fence, improved*	226
Conflagration dangers in cities	230	Quinine, the dose of	225
Congress, keep your eyes on	226	Rail fastening, safety	232
Convention, Cincinnati, the	228	Resolutions, Colorado	228
Cotton goods, bleaching, etc	232	Ripping attach. for scissors*	232
Crutch, improved*	232	SCIENTIFIC AMERICAN offices*	225
Disease, the economics of	229	Shellac, refining of	229
Explosives, power of, testing*	227	Shrinking, uneven	225
Fevers, malarial	225	Trade, free, and Dr. Crosby	225
Inventions, agricultural	233	Transit, rapid, N. Y., luxury of	228
Inventions, engineering	233	Trap, bottle, removable*	226
Inventions, index of	235	Treaty, commer., with Mexico	227
Inventions, mechanical	233	Tools, planer, forms of	232
Inventions, miscellaneous	233	Touching the tender spot	229
Lawns, forming and repairing	228	Warping machine, improved*	230
Laws, patent, attempt to change	232	Water softening	230
Lead, test for, new	232	Window bead fastener*	232

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 432,

For the Week ending April 12, 1884.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING, MECHANICS, ETC.—Testing Chilled Armor Plates.—With engraving 6887

The Armament Question.—Extracts of a lecture by Capt. C. O. BROWNE 6887

Speed Experiments with Ships' Models.—The power required, etc. 6888

Speed on Canals 6888

The New American War Steamers Dolphin, Atlanta, and Chicago.—Description of their construction, uses, etc.—With three large engravings 6889

The New War Ships.—A letter to the editor 6892

The New Steel Cruisers Compared with Vessels of Similar Classes in European Navies.—By M. P. HAYES 6892

The Atlantic and Pacific Ship Railway 6893

II. MISCELLANEOUS.—Speech of Hon. Orville H. Platt, of Connecticut, in the Senate of the U. S. on the bill providing for the reorganization of the Patent Office into an Independent Department, and for giving it the exclusive control of the building known as the Patent Office, and of the fund pertaining to the Office. Showing the relation invention bears to the progress of our country in all the different branches of industry, etc.; also showing why more room and more help are needed by the Patent Office, and giving many tables and statistics 6898

PATENTS IN CONGRESS.

The most interesting incident of the past few days relating to the patent agitation has been the delivery before the Senate, on the 31st of March, of a most remarkable oration on the "Reorganization of the Patent Office," by the Hon. Orville H. Platt, Senator from Connecticut, and Chairman of the Committee on Patents. We look upon this discourse as one of the most able, eloquent, and profound expositions ever pronounced concerning the nature of patents and the marvelous influence upon the country of new inventions. It is a wonderful essay, powerful in its reasoning, a great honor to its author; entitling him to the gratitude and respect of the nation.

Senator Platt begins at the very beginning of our patent system. He reproduces from the government archives records showing the gradual unfolding of the system, and tells us of the deep interest our fathers took in new inventions and new industries. He proceeds:

"Mr. President, to my mind the passage of the act of 1836 creating the Patent Office marks the most important epoch in the history of our development—I think the most important event in the history of our Government from the Constitution until the war of the rebellion. The establishment of the Patent Office marked the commencement of the marvelous development of the resources of the country which is the admiration and wonder of the world, a development which challenges all history for a parallel; and it is not too much to say that this unexampled progress has been not only dependent upon but has been coincident with the growth and development of the patent system of this country.

Words fail in attempting to portray the advancement of this country for the last fifty years. We have had fifty years of progress, fifty years of inventions applied to the every-day wants of life, fifty years of patent encouragement, and fifty years of a development in wealth, resources, grandeur, culture, power, which is little short of miraculous. Population, production, business, wealth, comfort, culture, power, grandeur, these have all kept step with the expansion of the inventive genius of this country; and this progress has been made possible only by the inventions of its citizens. All history confirms us in the conclusion that it is the development by the mechanic arts, of the industries of a country, which brings to it greatness and power and glory.

No purely agricultural, pastoral people ever achieved any high standing among the nations of the earth. It is only when the brain evolves and the cunning hand fashions labor-saving machines that a nation begins to throb with new energy and life, and expands with a new growth. It is only when thought wrings from nature her untold secret resources that solid wealth and strength are accumulated by a people.

Concede all you claim—free institutions, Christian civilization, industrious habits; grant respect for law; acknowledge all our vast natural resources; and then deduct patents and patented inventions from the causes which have led to this development, and you have subtracted from material, yes, from moral, prosperity nearly all that is worth enjoying. Subtract invention from the causes which have led to our growth and our grandeur, and you remit us, you remit our people, to the condition of the people of Italy, of Switzerland, of Russia. If "knowledge is power," invention is prosperity.

I am not a very old man, but recollection carries me back fifty years, when there was no railroad, no coal used, no steam power used; no woolen factories except of the rudest sort; no telegraph in Connecticut. Possibly there were one hundred tons of coal consumed in the State annually.

There was no carpet; no piano; few books; hand sewing only; hand knitting; the tallow candle; the unwarmed, unlighted church; the school house with its hard, rough benches; and the slow post route, the mail once a week; a weekly paper only. It was a week's journey from Connecticut to Washington; six weeks' journey from Connecticut to Ohio. Five thousand dollars in those days was a competence, and $10,000 was a fortune. What has accomplished all the transformation which we witness as we compare the condition of the country fifty years ago with its condition at the present day?

I insist, Mr. President, that it is traceable directly to invention. The railroad, the child of patented inventions, the production of cotton, silk, broadcloth, and linen, is due absolutely and entirely to the perfection of machinery for their manufacture. The daily press, the teeming books, are part of our civilization. They are all dependent upon patented inventions. The carpet, the piano, and the carriage conduce to our comfort and our convenience, and they are also children of patents. Every comfort which we have, every convenience which we enjoy, every element of wealth which we acquire, has its root and development in the patent system of this country. They are born of patents, and they live only by permission of patents.

The author then traces the growth of population, of imports and exports, of railways, production of coal, wool, values of agricultural lands, and the same lands where manufactures are carried on; he gives multitudes of statistics and tables; he presents proofs for all his statements.

Every department of business, every pursuit of organized life, has been fed, nourished, and enabled to keep step in this wonderful march of progress by the patented inventions of the age. . . . Imagine, if you can, how we should reach our agricultural regions, the great wheat fields of the West, without railroads; and I may say here that a railroad—from the steel rail to the top of the smoke stack, from its locomotive headlight to the signal lantern on the platform of the last car—is but one aggregation of patents. Think of the crops raised without improved plows, without seeders, without cultivators, without mowers, without harvesters, without thrashing machines! Think of the crops hauled to market by horses! Think, if it be possible, of the wheat converted into flour without patented milling processes! and say what proportion of profitable agriculture in this country is not due directly to patents and to the patent system of the country. The truth is, and there is no avoiding it, that you cannot disconnect in this country invention, manufactures, and agriculture. The triumph and the success of the one is the triumph and the success of all. They are interdependent, coequal factors, as it were, in producing our prosperity and our happiness; and so with regard to the other industries of the country, patents are directly connected with them all, and absolutely necessary to their successful pursuit.

We are a nation of 50,000,000 people, but we have the productive capacity of many more millions, how many more no man can estimate. Coal and water are now performing the work of human hands. What agents will perform them in the near future it is impossible to tell.

The steam power used in the manufactories of the United States, by the census of 1880, was equal to 2,183,488 horse power; the water power was equal to 1,225,379 horse power; making in all the horse power of the United States 3,408,867. Counting one horse power to be equal to that of six men, we have in the power used in the driving of our factories alone in this country the equivalent of the power of 20,453,202 men. The steam power used in driving our factories, not including the water power, is equivalent to the labor of 13,100,928 men; and of our 50,000,000 people only 35 per cent are supposed to be capable of labor—in round numbers, 17,500,000 laborers, persons capable of pursuing gainful avocations, in the country; and yet it would nearly take these 17,500,000 men to furnish the force that is exercised by steam in driving the engines of our factories, the wheels, the spindles, and the machinery of this country; and we do not begin to touch even then upon the saving of power by the use of the machines which are manufactured in these factories.

Take the capacity of locomotive engines as compared with the capacity of horses. We find that the locomotives in the entire country are doing the work of 29,676,960 horses on common roads.

Remember that eight-tenths of the manufacturing of the country is dependent on patented processes. Take the statement cited the other day by the Senator from Florida [Mr. Call], in which he quotes from Mulhall's Progress of the World, a book from which I have already quoted, as to the capacity of the sewing-machine:

'In effect, the adoption of machinery and steam has given mankind an accession of power beyond calculation. The United States, for example, make a million sewing-machines yearly, which can do as much work as formerly required 12,000,000 women working by hand. A single shoe factory in Massachusetts turns out as many pairs of boots as 30,000 boot-makers in Paris.'

Mulhall here gives the total horse power in comparison with steam as 13,071,000, the horse power of the world dependent upon the use of steam, equivalent to about 78,000,000 men.

Take the loom and see what it has done in adding to the productive capacity of the country.

In one of our manufactories you will see a girl of fifteen minding a machine that spins 2,100 miles of thread in a day—a thread that would reach from Washington to California.

Take the figures which I have given of the wool production and consumption of this country. In 1880 the wool grown was 290,000,000 pounds; that imported was 70,575,478 pounds. We exported 4,074,517 pounds, which left for home consumption in the United States 356,500,961 pounds of wool. Now, imagine for a moment what kind of a figure the mothers and daughters of the land would make in carding it with the old hand cards, or spinning it with the old spinning-wheel, or weaving it with the old hand loom. Take the single matter of cleaning cotton.

Under the old process of cleaning cotton, before the invention of the Whitney gin, a man could clean four pounds a day. The gins now in use clean 4,000 pounds a day.

Whenever a machine is invented which does the work of ten men with one attendant, nine men are released from that occupation in which they have theretofore engaged to engage in other productive operation. The men so released do not remain idle, nor do they descend in the grade of labor.

I know the argument is often used that inventions are opposed to the labor interests of the country. It is not true. There is a redistribution of labor whenever a new labor-saving machine is invented, but there is no destruction of labor. There is no degradation of labor in invention. The man released from a particular kind of labor by the introduction of a labor-saving machine does not go down in the grade and scale of labor, but he ascends. He engages in some higher employment, in some more productive vocation, for patents elevate the laborer. New inventions open new fields of labor. The laborer who lives and breathes the air of invention produces more, man for man, than he who does not live in such an atmosphere, for patents are educators.

Property in patents is a property which contains within itself the principle of the reproduction of property, and that

© 1884 SCIENTIFIC AMERICAN, INC

is a characteristic which attaches to no other species of property. Every patent has in it the germ of a new patent, which in turn is property. Like that marvelous creation of God, 'the tree, in the which is the fruit of a tree yielding seed,' every patented invention contains the fruit of an invention yielding seed. For instance, the telegraph generated the telephone, and other motors are to be the progeny of the steam-engine. The children of the steam-engine are already born that shall grow up to perform their work more easily, more expeditiously, more cheaply than the parent invention.

Nature is one vast storehouse of wealth, but it is a locked storehouse, and the human brain alone can unlock it. Invention is the magic key. Men seek gold in the bowels of the earth, but it lies in the air, in light, in the gases, in electricity. It needs no enchanter's wand, no talismanic words, to set it free—only the processes of thought.

Let me give you an illustration of the saving of patents. I take perhaps as the most marked instance of the saving made by the use of patented inventions the Bessemer steel plant.

In 1868 the average price of steel rails was $165 per ton. The price since the commencement of 1884 is $34 per ton. The production of steel rails in 1883 was 1,295,740 tons. The same quantity made in 1868 would have cost more than they cost in 1884 by $168,446,200. That is the saving of a single year as the result of this invention.

But when we have thus considered the saving in the cost of production we have just begun to consider the saving which is effected by this patent. The entire transportation question of the country has been affected by it. The life of a Bessemer steel rail is double the life of an iron rail; it is more than double, and it is capable of very much harder usage. Now take a single fact as suggesting the saving, aside from that of cost of the production of the steel rail which has been effected by this patent. In 1868 the freight charge per bushel from Chicago to New York was by lake and canal 25·3 cents, by all rail 42 6 cents. In 1884 by lake and canal it is 9 cents only, and by all rail 17 cents only. Now take the 119,000 miles of railroad in the United States which are used in the transportation of merchandise. Apply that fact to the reduction of the cost of transportation, a large portion of which has resulted directly from the use of the Bessemer steel rail, and tell me if you can estimate, see if you can find the figures which will represent the saving to this nation by reason of the use of this one patented invention.

This leads me to speak of the value of patents as measured by their effect in enhancing the value of their products. Here we have no data, and every one must judge from his own standpoint and from his own opinion as to how much has been added to the wealth of this country which would not have been added to it except for our inventions and our patent system. How much has been added to the value of land which otherwise would not have been fenced, how much to the value of urban property consequent upon the improvement and development of farms; how many cities owe their existence to the production of the Bessemer steel rail; how much, to come home to our own city, of the $5 per square foot of land near the outskirts of Washington is due to patented inventions? These are suggestive inquiries.

For my part, I believe that two-thirds of the aggregate wealth of the United States is due to patented inventions. Two-thirds of the $43,000,000,000 which represents the aggregate wealth of the United States, in my judgment, rests solely upon the inventions, past and present, of this country. The only way to test the opinion is by imagining the effect upon values which would follow a prohibition of the use of patented inventions.

Take the expired and unexpired patents; prohibit the application of steam to the creation of power; prohibit the use of patents relating to agriculture and the production of the cereals and of cotton; prohibit the use of the inventions relating to electricity in all its uses; prohibit the use of inventions relating to printing, and tell me how much you have subtracted from the value of the property of this country? Tell me what the property of the country would be worth with such a prohibition? Then banish the knowledge of them, and tell me how this wealth is to be reproduced.

I would gladly speak here of the addition to our comforts and our enjoyments by the use of patented inventions, but I forbear. If we can conceive a situation in which we should live in a home in the building or fitting up of which no patent was employed; eat our family meal in the provision or preparation of which there was no invention; be clothed in apparel into the making of which no patent entered; ride to our business in a conveyance in the construction of which all patents were prohibitory; read only such books and papers as were produced without the intervention of patented machinery, we may realize partially how much of our social and domestic happiness is derived from patents.

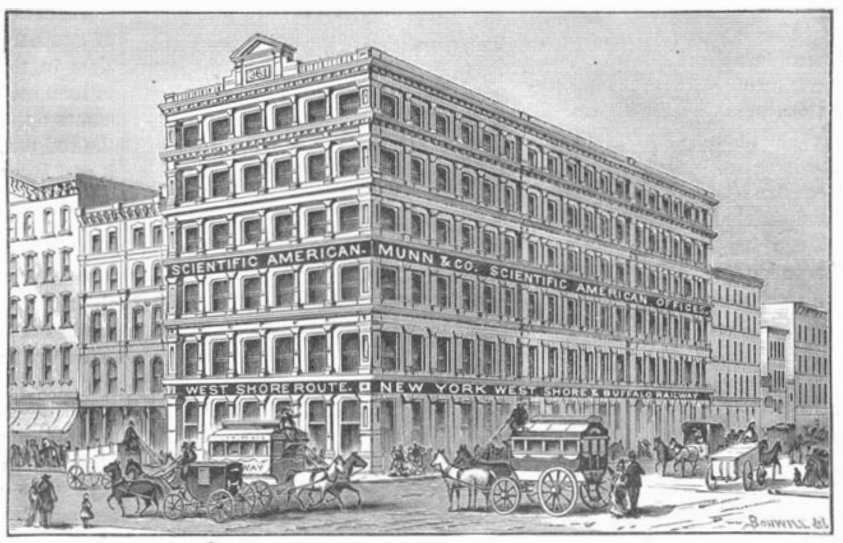
We protect all our personal property by patents, we lock it up with patented locks, and if anybody breaks through and steals our treasures we overtake the thief by a patented telegraph. We defend our national honor by patents. We heard only yesterday that an unfortunate riot occurred in one of our principal cities. It was the telegraph which summoned the troops of the State to Cincinnati; it was that subtle force, so intangible, impalpable, invisible, that we scarcely know whether it is material or spiritual, which the inventive genius of man has harnessed to do his business, which at an instant's time summoned soldiers from all sections of Ohio to the defense of Cincinnati.

A distinguished member of the Army told me within a short time that the only reliance of this country in case of war was upon the inventive genius of its people; that it had no Navy, that it had no sufficient Army, that it could only defend itself by a special exercise of the inventive faculty of its citizens in calling into immediate use and power new implements of warfare.

Is not this vast system of property worth protecting? Does not the patent system attain a dignity which entitles it to fair and generous treatment? Is it not large enough to be independent?

I have heard it said that we should have all these inventions anyway; that men would have invented without regard to the encouragement which was given to them by our patent laws; that if this exclusive use of their inventions had not been secured to them for a term of years, that if their property in patents were not protected, yet they would have gone on and will go on inventing all the same; that there has been in some way a marvelous birth in this country of inventive capacity, and that it must grow whether it is protected or not.

Mr. President, it is not true. The inventor is no more a philanthropist than is the agriculturist. He works for his support. He works to achieve a competency. He invents, if you please, to become rich; but he is no more a philanthropist than any other man in any other walk or vocation of life, and you have no right to demand of him that he shall be a mere philanthropist. He is entitled to his reward. He is a laborer entitled to his hire, entitled to it more if possible than any other laborer, as his labor is higher in dignity and grandeur than that of any other laborer.



THE NEW OFFICES OF THE SCIENTIFIC AMERICAN, 361 BROADWAY, CORNER FRANKLIN STREET.

The universal testimony of all inventors is that it is the reward which they hope to secure which stimulates their efforts. Is it so that an inventor, of all the men in the world, has no right to his reward? Is it so that he has no right to be protected in his property? It is the security to an inventor of his invention which makes it valuable, and which stimulates him in his effort to make new inventions.

Mr. President, every round of the ladder on which we have climbed to national pre-eminence is a patented invention, and every sign-board which points to a greater future of achievement and progress shows that the path continues to lead through the field of invention. We are nearing the end of the contest to which our fathers invited us, when they gave to our Government the power to promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries. That contest was for the supremacy of the world, and the prize is now in full view.

Shall we forget, shall we neglect, the system which has enabled us to outstrip our competitors in the race, or shall we the rather perfect and develop it, that through its perfection and development we may attain still grander results?

We stand to-day in the gateway of a most marvelous future. Let us hope that eyes may be given us to see that the inscription over the gate reads, 'Protection to the American patent system and all that it comprehends and involves.'"

Our limited space forbids further quotations. For the full text of the oration, the reader is referred to our this week's SUPPLEMENT, in which it fills nearly ten pages.

THE DOSE OF QUININE.—Professors Bartholow and Da Costa agree that the antipyretic dose of quinine is not less than five grains every two hours until four doses are taken, or else thirty grains in two or three doses close together. The former believed a small dose of morphine given with quinine is the best thing to counteract the unpleasant cerebral symptoms of the latter.

MALARIAL FEVERS.

In an article in the SCIENTIFIC AMERICAN of March 22, in which the spread of malaria was traced into many regions formerly exempt from the disease, the town of Litchfield, Conn., "a city set on a hill," was instanced as having succumbed to the mysterious invader. It is gratifying to be able to present the evidence of the principal physicians of that favored locality showing that malaria has no habitation there. May her peaceful hills and vales be forever salubrious!

To the Editor of the Scientific American:

An editorial in your paper of March 22, states that "Litchfield, a city set on a hill," which has always boasted its healthfulness, acknowledged the tread of the invader in 1880, and he had come to stay, to their disgust.

The undersigned, practicing physicians for many years past, desire hereby to contradict the above statement in the most positive and unqualified manner, and to state that we have not, either in 1880 or any other year, known of a single case of malarial fever originating in this village, or its immediate vicinity.

HENRY W. BUEL, M.D.
HOWARD E. GATES, M.D.
WM. DEMING, M.D.
WILLIS J. BEACH.

Litchfield, Conn., March 28, 1884.

NEW SCIENTIFIC AMERICAN OFFICES.

The growth of the business connected with the SCIENTIFIC AMERICAN is such that we have been compelled to change our headquarters; and we have now removed to the new and splendid fireproof building No. 361 Broadway, corner of Franklin Street, a few steps from our old place. Our engraving shows the exterior appearance of the building. Here in the third and fourth lofts the SCIENTIFIC AMERICAN, the SCIENTIFIC AMERICAN SUPPLEMENT, the SCIENTIFIC AMERICAN EXPORT EDITION, and the world-renowned SCIENTIFIC AMERICAN PATENT AGENCY, are now located. Taking the elevator at the street door, 361, our friends will land on the main floor of the principal office, a beautifully lighted, airy apartment, more than fifty feet wide and one hundred and sixty feet long. It is furnished with everything needful for the prompt and efficient execution of business, and forms undoubtedly the finest patent office in the world. We cordially invite our many friends in town and country to call in and take a look. Remember the number and tell everybody—MUNN & Co., 361 Broadway.

UNEVEN SHRINKING.

Much loss is occasioned in the foundry by uneven shrinking of castings, causing distortions and fractures. Some of these may be avoided by previous preparation in the construction of the patterns. Rimmed wheels with arms, like pulleys and gears, are particularly liable to these shrinkage losses. This is because the continuous rim and the solid hub retain their heat longer than the separated and comparatively light arms. The remedy that suggests itself is to make these arms longer, so as to allow them more shrinkage. Obviously the only way to lengthen the arms is to make them dishing; instead of having them run on a straight line from rim, through the hub, to rim, deflect them out of a right line, having the result of making a dished wheel, the hub being out of line with the edges of the rim, and the arms on a corresponding slant. The amount of this "dish" or drop of the hub should be about that of the estimated shrinkage of cast iron—one-eighth of an inch to the foot. Thus, a pulley of twelve inches diameter and six inches face should be dished by the patternmaker so that the hub drops about one-eighth of an inch below the level of the pulley rim edge.

Pulleys and gears cast with these dished arms come straight on cooling, and they do not require to be uncovered—or partially uncovered—in the mould to facilitate even shrinkage. Every machinist knows what annoyance he has suffered from the chilling of cored hub holes and of the rims of pulleys, the core hole in the hub being sometimes swabbed while red hot, and the sand from the rim dug away, making much trouble in boring, and necessitating the grinding of a pulley face instead of turning it.

Doctor Crosby and Free Trade.

The Reverend Howard Crosby, one of New York's most useful and energetic citizens, as well as celebrated divines—a man full of patriotism and good works—sent the following characteristic reply to an invitation to attend a recent free trade dinner in this city:

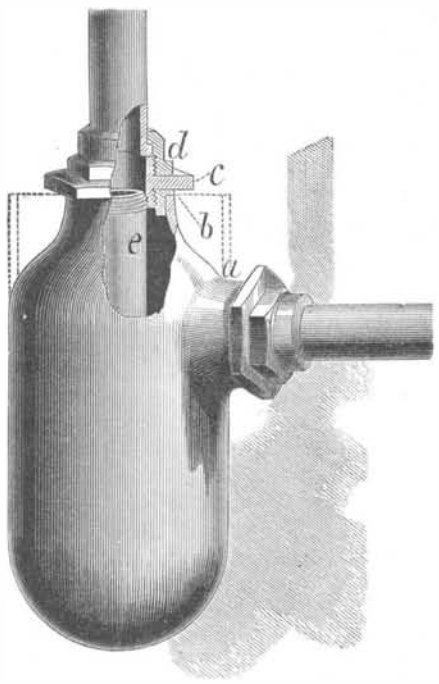
"I have received your invitation to purchase a ticket to the Free Trade Club dinner, which I should accept were I a free trader, but I am a benighted protectionist, and could have no place at your table, unless to hear words of wisdom to convert me; but these I can get in the morning papers, and weep over my errors without being seen."

Such men as the above model citizen are just the men to take hold of the tariff reform question in place of the parlor statesmen, who have never done anything for their country except to talk and live off of her by eating more than they produce.

© 1884 SCIENTIFIC AMERICAN, INC

REMOVABLE BOTTLE TRAP.

The object of an invention recently patented by Mr. G. M. McCloskey, of No. 191½ Atlantic Avenue, Brooklyn, N. Y., is to facilitate the cleaning of bottle traps and also to increase the ease of attaching and detaching the traps from the pipes. The body of the trap is cast in the shape of a cylindrical cup, as indicated by the dotted lines in the engraving. The open end is spun so as to fit upon the screw tube,



McCLOSKEY'S REMOVABLE BOTTLE TRAP

b, which is soldered in place, and into which is screwed the tubular part, *c*. Upon the outer part of the tube is screwed the coupling ring, *d*, whose inwardly projecting flange holds the inlet pipe firmly in place. The pipe, *e*, is screwed into the inner end of the tube, *c*, so as to form a continuation of the inlet pipe extending nearly to the bottom of the trap. The upper part of the side of the trap is cast upon a female screw similar to the one shown at *b*. The outlet pipe is held in place in the same way as the inlet. With this construction the trap can be disconnected from the outlet and inlet pipes by unscrewing the coupling rings, so that it can be easily cleaned and replaced. The trap being cast in one piece, soldering of the parts is done away with.

CORN PLANTER.

The annexed engraving represents an invention patented by Mr. Charles J. Mikesh, of Conover, Iowa, which is designed to facilitate the operation of corn planting. The wheels are made with wide concave rims to adapt them to cover the seeds. The ends of the axle are attached to the side bar of an outer frame which incloses the machine, and to the forward end of which the tongue is secured. An inner frame, fitting in between the hubs and resting upon the axle, oscillates freely between the cross bars of the outer frame. To a support attached to the rear bar of the outer frame is pivoted the end of a lever which, at a short distance from the end, is joined to the inner frame by a bar. The forward end of the lever moves along a notched circular bar as shown. By moving this lever the inner frame is oscillated, and by means of the notched bar and bolt, which is operated from the handle, the frame can be locked in any desired position.

To the lower ends of angular shaped bars journaled upon a cross rod are attached plows which open the furrows to receive the seed. A spring bearing upon the horizontal portion of the bar holds the plow down, yet permits it to move up when it encounters an obstruction. This construction is clearly shown in the engraving, in which the forward part of the side bar is cut away. The seed boxes are secured to the forward cross bar of the inner frame. The two seed dropping slides are connected by a rod which is joined by a link to an arm projecting upwardly from the end of a short shaft whose other end is rigidly attached to the center of a bar, which is so placed that the driver, when sitting upon the seat, can rest his feet upon the ends and so operate the seed dropping slides. The slides at the lower ends of the boxes receive the seeds from slides placed near the center (both sets of slides are operated by the same bar), and at the next movement of the dropping mechanism drop the seed in a bunch through the funnels to the ground.

Efficiency of Coal.

A pound of average coal develops, with perfect combustion, 12,000 units of heat, which, multiplied by 772, the mechanical equivalent in units of work of one unit of heat, equals 9,264,000 foot pounds of work, representing barely a consumption of one-quarter pound of coal per indicated horse power per hour. The very best engines of modern times, leaving out only a few exceptional cases, require not less than 2½ pounds of coal per horse power per hour. The average engine uses very much more.

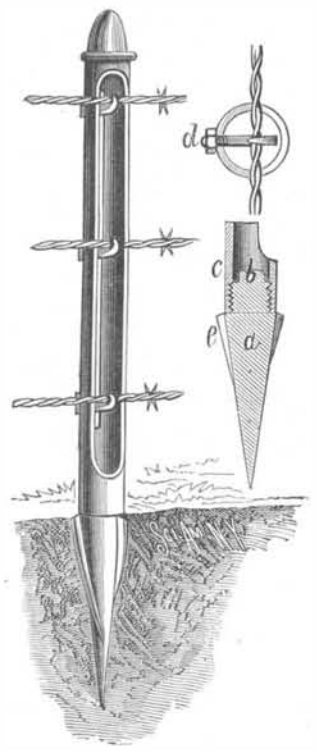
Keep Your Eyes on Congress.

"Some of the bills now before Congress, notably those of Mr. Anderson and Mr. Voorhees, should they become laws, would prove a death-blow to our most flourishing industries. They would be more disastrous in their effects than an immediate adoption of absolute free trade. They would rob honest men of the fruits of their brain labor in order to benefit a few who are too lazy mentally, morally, and physically to exert what little ability the Lord in His generosity saw fit to waste on them.

"Shame on all who do not stand up manfully in defense of the right of every man to enjoy the honest fruits of his labor, mental or physical! More shame on those who, being intrusted with the duty of protecting those rights, neglect that duty, and are silent when their voices should be heard in vigorous protest! But greatest shame of all on those who willfully betray their trust and besmirch their reputations by advocating this wholesale robbery of a class of men to whom the nation is indebted for much of its present greatness!"—*Sewing Machine Journal.*

IMPROVED FENCE POST.

The base of the post consists of a cast iron point, *a*, having spiral flanges, *e*, and a shoulder above which is a screw threaded section and a driving head, *b*. This section is driven into the ground about to the shoulder. The upper section is made of a suitable length and size of gas pipe, about one-half of which is cut away as shown in the accompanying perspective and sectional views. Through the back of the remaining part is cut a slot which is nearly as long as the open front portion. The lower end of the pipe is screw-threaded to fit upon the ground section, and the upper end is fitted with a plug. Wires are secured to the posts by hook headed bolts (shown at *d*, in the cross sectional cut) which extend through the slot, and are held by nuts so as to draw the wires firmly against the two edges of the post; two bearing points are thus formed, against which the wire may be clamped and securely held at any desired height.

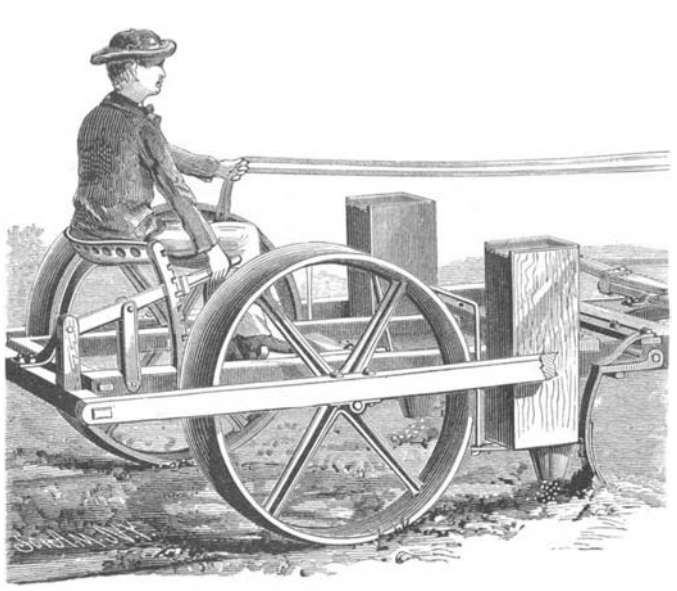


MINER'S IMPROVED FENCE POST.

When deemed advisable, in order to make the fence more easily visible to animals, the upper hook may be replaced by a bolt, having an L form, for holding the lower edge of a board, the upper edge being passed under a lip formed in the top of the pipe.

This construction makes a simple and durable post which can be quickly and easily set.

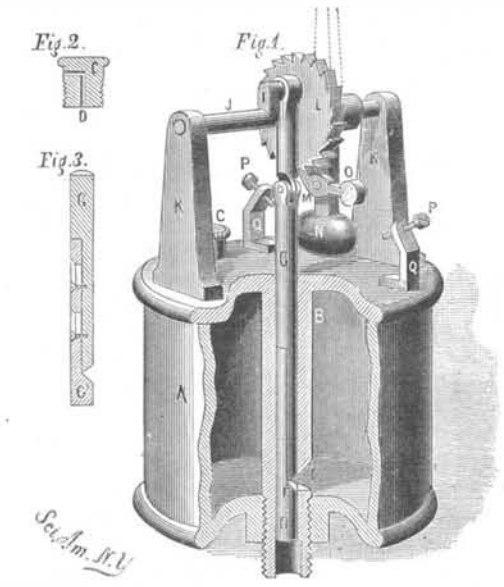
This invention has been patented by Mr. E. D. Miner, of Dayton, Washington Territory.



MIKESH'S CORN PLANTER.

IMPROVED VALVE OILER.

The accompanying cut shows an invention, recently patented by Mr. S. D. Mershon, of Rahway, N. J., which is designed to facilitate the oiling of the moving parts of machinery, and also to secure regularity in the amount of oil delivered. Through the center of the oil cup, A, passes a tube, B, which may be made solid with the top and screwed into a hole in the bottom. Oil is introduced into the cup through an opening in the top that is closed by a cap, C, having a hole, D, through it, as shown in the sectional view, Fig. 2, in order to admit air to the cup to take the place of the oil as it is discharged. In the lower part of the



MERSHON'S IMPROVED VALVE OILER.

tube, B, is an opening, E, through which oil passes to the interior and enters the recess, F, in the rod, G. This rod fits accurately in the tube, and its lower portion is made up of two halves held together by screws passing through short slots in the extension part, G', as indicated in the longitudinal section, Fig. 3. When the rod is raised, the recess comes opposite the opening and becomes filled with oil; as the rod moves downward the oil in the recess is carried with it and flows out through the lower part of the tube to the surface to be oiled. The upper part of the rod is jointed, and its upper end is attached to a crank formed upon a shaft, J, revolving in bearings, as shown. At each revolution of the shaft the recess, F, discharges its contents. On the shaft is secured a ratchet wheel, L, into the teeth of which meshes the end of a pawl, M, which is pivoted to, and operated by, the swing of the pendulum, N. The pawl is held in gear with the wheel by the weight on the arm, O. The jar of the engine will keep the pendulum in motion; but it may be extended as indicated by the dotted lines and actuated by an arm attached to some moving part of the machinery. The swing of the pendulum is limited by the set screws, P, passing through the upper ends of the standards, Q. By means of the set screws the movement of the pendulum can be regulated so as to move the wheel through the space of one or more teeth, thereby increasing or diminishing the time required for the shaft to make a revolution, and thus regulating the time between the discharges of oil.

Lead Pencils.

With the improved machinery now used, ten hands will make about four thousand lead pencils of the cheaper grade a day. The cedar comes chiefly from Florida, and it is received in slabs of pencil length, one for the lead to go in and the other to cover it, as may be seen by examining the end of any lead pencil. Four little grooves are sawed in the thicker slabs, for the leads, which are kept in hot glue and taken one by one and inserted in the grooves. Then the thin slab is glued to the leaded slab, and, thus united, they are run through a moulding machine, four pencils coming from each slab. After the ends are rasped they are run between grooved wheels at considerable pressure for the only finish they get. This burnishes them, and they are tied in dozens and boxed for sale, mostly in plain wood, and of three degrees of hardness. The graphite used comes in a fine black powder, and is mixed with German white clay, about half and half, and then ground with moisture, forming a paste. This is pressed in dies into lengths of four leads, which are cut and then baked at a very high temperature. These sell at 85 cents, $1.50, and $2 a gross, and are very good articles, writing smoothly and evenly. The manufacturer makes about one hundred per cent, selling the pencils at eighty-five cents a gross, and the retailer makes a good thing selling them at a cent a piece. The graphite costs about twenty-five cents a pound, and the clay little more than the freight. The more clay is used in the leads the harder they will be. The cedar is cut mostly from fallen trees in Florida swamps.—*Geyer's (N. Y.) Stationer.*

THE report that a party of Americans intend purchasing the volcano Popocatepetl or Vesuvius, and erecting extensive works there for the mining of sulphur and the manufacture of sulphuric acid, lacks confirmation.

© 1884 SCIENTIFIC AMERICAN, INC

A New Commercial Treaty with Mexico.

Any legislation which has a tendency to make it easier for manufacturers to export the productions of our workshops and factories cannot fail to meet with general appreciation, while it will be particularly welcome to the mechanics and artisans of every trade. Of such a nature is the new treaty with Mexico, ratified by the United States Senate March 11. Nearly all our exports heretofore have been of agricultural productions, but a proper growth and healthy expansion of our manufacturing industries cannot be steadily maintained without materially enlarged foreign markets. We need more customers ready to take our surplus of manufactures, above what is required to fill the home demand, and it is eminently proper that we should take a step in advance in this direction by making a sort of reciprocity treaty with our neighbors in the Southwest, of the Mexican Republic. They are in want of many things now, and with the opening of new railroads through the country will want far more, which it would be, indeed, a pity to send them to Europe to buy while our factories are far from being overworked.

Under the treaty, which has just been ratified by the U. S. Senate, the chief agricultural products of Mexico, including leaf tobacco, are to be admitted to the United States free of duty. The list of articles on the free list embraces few manufactures, and contains many entries now admitted free. Among the manufactured articles is sugar of not above No. 16 Dutch standard in color. The schedule of articles to be admitted free into Mexico from the United States contains over seventy entries, and comprises five great classes of manufactures—railroad machinery, steam engines, agricultural implements, mining machinery, and building materials. To these are added coal of all kinds, petroleum, naphtha, precious metals, sewing machines, vehicles of all kinds, clocks, stoves, and many minor manufactures and materials. The treaty will remain in force for six years.

The Power of Boilers.

At a recent meeting in Manchester of inspecting engineers and other gentlemen interested in the inspection of engines and boilers, the question of the so-called horse power of boilers was raised by Mr. Boswell, and the debate which followed was well sustained, the general opinion being that the term "horse power" as applied to a boiler was wholly wrong, and should be abandoned. It was suggested that boilers should be rated by their evaporative capacity; but to this it was objected that the factors of this capacity were—quality of coal and water, the method of seating adopted, the area and altitude of the chimney, and, not least, the brains or skill of the fireman. Mr. Richard Thompson, the senior inspector of the Manchester Steam Users' Association, contributed very greatly to the interest of the debate by his contribution of facts acquired in actual experience, as did also the majority of those present. It appeared that a full-sized Lancashire boiler, 7 feet by 28 feet or 30 feet, might, so far as horse power was concerned, develop anything up to 380 or 400 horse power, according to the conditions, which would of course include a very economical engine. A fact of great value, not sufficiently known, was brought up, namely, that when the evaporative efficiency of a Lancashire boiler was being tested at atmospheric pressure, the whole of the steam generated being discharged through a short 6 inch pipe with one right angled bend in its length of a few feet only, the pressure in the boiler rose to 3 pounds per square inch by the gauge, showing most conclusively that at such a low pressure it requires a safety valve to a boiler with at least an outlet area of 25 square inches. Whatever may be the pressure in a boiler, it will practically evaporate the same weight of water, but an orifice will practically discharge a constant volume at all pressures, and the volume varying almost inversely with the pressure, a safety valve will discharge more steam at a high than at a low pressure, and therefore a high pressure boiler does not require so great an area of safety valve as does one at a low pressure.

An Anecdote of Peter Cooper.

The head of the Women's Art School of Cooper Institute writes of Peter Cooper, in the *Century:* "One day he stood watching the portrait class, who, to the number of thirty pupils or more, were drawing likenesses of the same model from different positions. One scholar made the face in profile; another had it turned a little into the shadow; a third saw more of the full face; while others worked still further into or away from the light. He had stood observing the scene for a few minutes, when he said, 'Such a sight as this should be a lesson in charity, when we perceive how the same person may be so different, according to the way he is looked at by various people.'"

PANCLASTITE.

The new explosives known as panclastite, which have attracted so much attention from engineers and chemists, form a group which has no connection with any other known explosives. They are possessed of peculiar properties and power, and merit a description. The combustive element of this new section of explosive bodies, which is the discovery of Mr. Eugene Turpin, is peroxide of nitrogen. The combustible body may be formed of different substances, such as sulphide of carbon, petroleum, toluene and xylene, benzoles, and vegetable and animal oils. Each of these substances gives a different explosive endowed with special properties. Another group is formed of a mixture of peroxide of nitrogen with nitrobenzine. This latter group gives products of great stability. In fact, the combustible being already nitrated to saturation by nitric acid, the peroxide of nitrogen has no action upon it, and intervenes, merely as a combustive, by its simple admixture, to render it explosive. These compounds are specially adapted for military purposes.

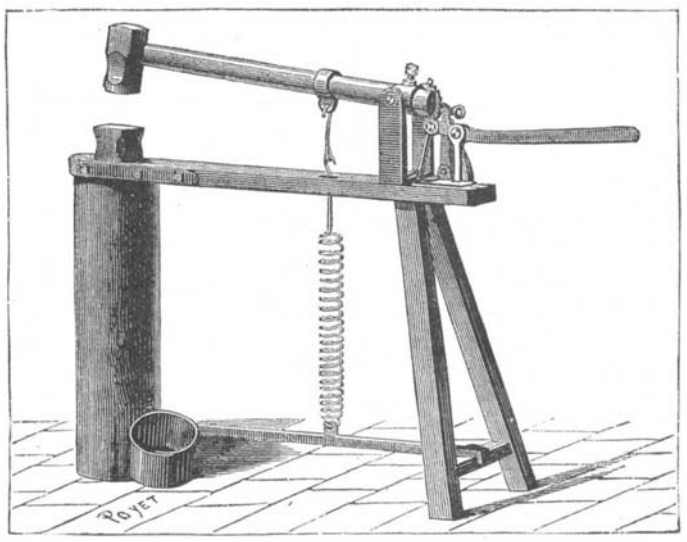


Fig. 1.—TURPIN'S PERCUSSION APPARATUS FOR EXPERIMENTING UPON EXPLOSIVES.

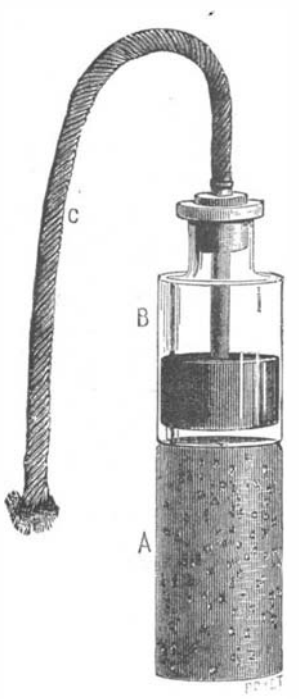


Fig. 2.—ARRANGEMENT FOR TESTING POWER OF EXPLOSIVES.

In principle, panclastite for industrial purposes consists of two liquids, one soluble in the other, which are inert taken separately, but which it is only necessary to mix together to at once obtain, without any other operation, an explosive that is more powerful and more instantaneous than nitroglycerine.

Certain mixtures thus obtained resist shocks better in the liquid state than any other known explosives, even ordinary mining powder. Ordinary powder explodes under the shock of an iron weight of six kilogrammes falling from a height of half a meter. Gun cotton and other products of the same section explode under the fall of the same weight from a height of a quarter of a meter. Seventy-five per cent dynamite explodes under the same weight falling 0·15 meter, and dynamite gum explodes under a fall of from 0·20 to 0·25 meter. Pur nitroglycerine explodes under a fall of 0·10 to 0·15 meter. Panclastite in a liquid state does not explode under the shock of the same weight falling *four meters.* All these experiments were made under exactly the same conditions by means of apparatus constructed by Mr. Turpin, and one of which is shown in Fig. 1.

Certain compounds of panclastite are non-inflammable, while others are more or less inflammable, but never detonate through fire alone, in an open vessel. All the inflammable compounds burn quietly in the open air. It requires a preliminary explosion to bring about one of panclastite, such, for instance, as that of a primer charged with fulminate of mercury. Certain of the compounds burn so quickly and with so brilliant a flame that Mr. Turpin has been led to devise a portable apparatus for optical telegraphy at night, in which this material is used as an illuminating agent. Panclastite, considered as an explosive, enjoys the peculiar and valuable property that its sensitiveness and power may be varied at will. All the experiments with it have been made with the mixture that is least sensitive in a liquid state.

But its sensitiveness may be made such that a hermetically closed vessel filled with the mixture will explode under its own weight in falling from a height of from one to two meters upon hard ground. On the contrary, the sensitiveness may be made so slight as to make it impossible to explode it under the influence of a primer charged with 3 grammes of fulminate of mercury. Finally, as with nitroglycerine, panclastite may be united with an active porous substance, such as powder, vandanite, etc. In such a case, it again loses its sensitiveness to shock.

When dynamite and panclastite are caused to explode in the open air upon leaden cylinders, it is found that the effects produced by panclastite are infinitely superior to those obtained with a larger quantity of dynamite.

Fig. 2 shows the arrangement before the explosion. A is the leaden cylinder, B is a bottle placed upon it and containing the explosive, and C is the priming and fuse. Here the bottle is represented as containing 10 grammes of panclastite.

Fig. 3 shows the leaden cylinders before and after the explosion. No. 1 represents the cylinder before the explosion, No. 2 the same cylinder crushed by the explosion of 20 grammes of dynamite gum, and No. 3 a cylinder crushed by the explosion of 10 grammes of panclastite. As may be seen, the effect produced by the new explosive is greatly superior to that given by dynamite, notwithstanding that the former be used in much less quantity.

Among other open air experiments that have been tried with it we may cite the following: An iron rail was placed upon an oak tie, and, in the channel between the flange and head, there was laid a cartridge containing 60 grammes of panclastite primed in the ordinary way. When the fuse was lighted a violent explosion ensued and the rail was literally crushed into fine bits, the majority of which were driven deeply into the tie, the latter itself having been broken.

Some of the fragments of the rail weighed but a few grammes. For these details and the engravings we are indebted to *La Nature.*

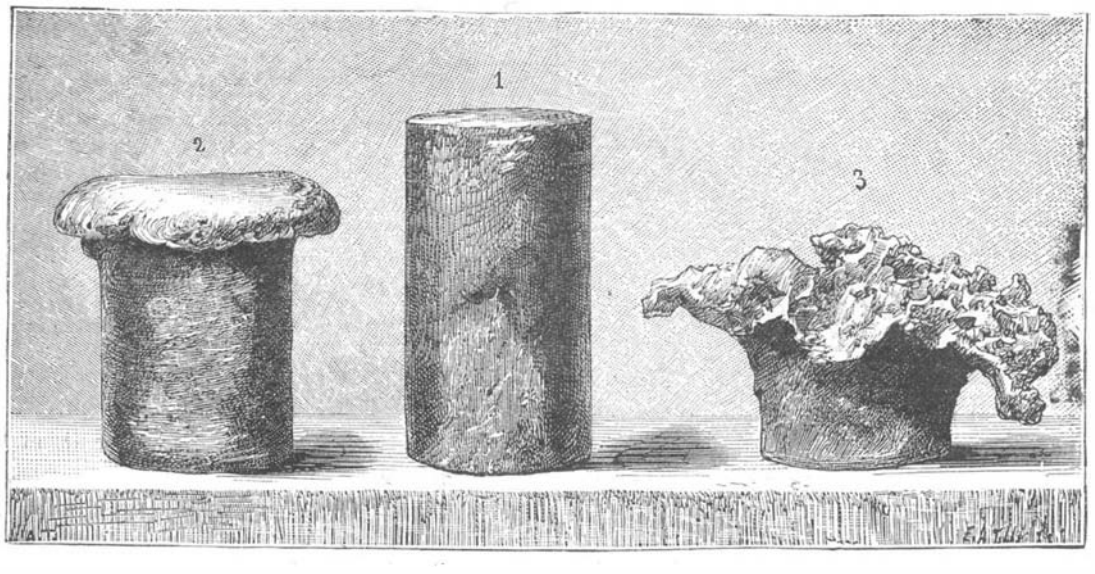


Fig. 3.—COMPARATIVE RESULTS GIVEN BY THE EXPLOSION OF DYNAMITE AND PANCLASTITE.

Air.

Mean pressure of the atmosphere, at the level of the sea, is equal to 14·7 pounds per square inch, or 2,116·4 pounds per square foot. One atmosphere of pressure is measured by a column of air at 32° Fah., 27,801 feet, or about 5¼ miles, high, of uniform density equal to that of air at the level of the sea.

The density, or weight, of one cubic foot of pure air, under a pressure of one atmosphere, or 14·7 pounds per square inch, is, at 32° Fah., equal to 0·080728 pound. At 62° Fah., the weight is 0·076097 pound.

The volume of 1 pound of air, at 32° Fah., and under one atmosphere of pressure, is 12·387 cubic feet. The volume at 62° Fah. is 13·141 cubic feet.

The specific heat of air at constant pressure is 0·2377, and at constant volume 0·1688, that of water being taken as 1

© 1884 SCIENTIFIC AMERICAN, INC

Forming and Repairing Lawns.

The making of new lawns, and the best means for keeping old ones in good condition, and the keeping of our grass plats, great or small, free from weeds, are themes which interest and affect the majority of persons residing outside of our cities, and this is our excuse for so frequently referring to the subject.

The last number of the *Garden* (London) publishes the following article on lawns and their treatment, which contains much useful and timely information.

It has been said, and with much truth, that there is nothing which adds so great a charm to English homesteads as the lawns or grass plats that are generally to be found surrounding them; and, as this is the season to form, relay, or repair them, a few remarks as to the proper mode of procedure may possibly be useful. In forming new lawns, it is hardly necessary to say that their extent must be dependent on the ground at command; every endeavor should, however, be used to make them as roomy as possible, and toward this end much may be done by placing the shrubs and trees, or at least the greater part of them, as far away from the house as the boundary will permit; any that stand out ought to be of the best kind. A lawn need not necessarily be flat or level; it may, on the contrary, be undulating, according to the natural formation of the ground. In preparing the latter for the turf, the most important thing is to see that any portion which has been moved is well rammed, for if not it will be continually subsiding, and nothing looks worse than little hollows caused by the settling of earth.

Another important matter to bear in mind is that the soil of lawns should not be rich, for if so the grass not only grows fast, but coarse, and it is impossible under such circumstances to get a good thick bottom or to keep it in anything like the perfect order attainable when the roots are less fed. This being so, it is a good plan to use sand, or to cart poor earth for the leveling and finishing off of the top, but when so applied it should be put on regularly or the grass will be patchy, which will spoil the effect of the whole. The leveling being completed and the surface raked smooth and fine, the next thing is either to sow seed or use turf, the latter being by far the best way, for though it involves more labor, time, and expense, the work is at once complete, while if seed be sown it takes a year to get a good bottom. The most suitable turf is that from pastures or waste places by the road-side which have been closely fed off and the grass is short and fine, with a sprinkling of white clover in it. If the turf of this kind can be got, a fine lawn may soon be made.

The most handy turfs to work with are those a yard long and a foot wide, and the thinner they are, so long as they will hang together, the easier will they roll and lay down again. No open joints should be left for the air to get in; to prevent this it is a good plan to pass the roller over the turfs quickly after they are down, so as to press them to the earth, in which the grass will soon take root. If any inequalities of surface should by chance exist after the roller has been used, they may easily be beaten down by means of a rammer when the ground is soft. Where fine turf cannot be had and seed has to be sown, it should be got specially for the purpose from some seedsman, as that otherwise obtained is full of weeds, and never makes a good lawn. The time to sow is about the middle of March, when the seed should be scattered evenly over the surface of the finely raked ground and slightly covered, after which, if birds are kept from scratching it out and devouring it, it soon germinates and grows at a quick rate if the weather proves favorable.

Lawns that are in a thin, patchy condition may be improved in two ways: the one by cutting out the bare or worn parts and relaying with fresh flag, and the other by a top-dressing of rich, finely sifted soil, to which should be added some soot and fresh slaked lime, which will not only stimulate the grass and give it a rich, deep green color, but will also kill all moss, which on some lawns is very troublesome, and if not checked or destroyed soon gets entire possession. Daisies and plantains, too, are often a nuisance, and to eradicate these weeds there is no plan better than cutting or digging them out, which, unless they are thick, is no great task if set about in real earnest with a sharp and suitable tool. D. S.

The Luxury of Rapid Transit in New York.

"The city of New York is provided with thirty-three miles of double railway tracks, built on iron posts—iron bridges, in fact—which occupy some of the finest streets and avenues. On these tracks the steam passenger trains roar and whiz along at intervals of a minute in each direction; the smoke and cinders are poured into the windows of the adjacent dwellings, in many cases only two feet from the railway; awnings are set on fire by sparks; passengers and workmen are frequently knocked off from the station platforms, and fall twenty feet to the pavement, to be picked up dead; tools, hot water, fire, and lumps of coal drop upon the heads of luckless pedestrians or car men in the street below; and, finally, light iron shavings, cut from the wheels of the cars by the brakes, float down through the air and lodge in the eyes of passers by. These are a few of the nuisances which New Yorkers endure for the sake of enjoying the luxury of rapid transit.

"One of the car drivers on the Sixth Avenue horsecar line, the track of which runs directly under the steam railway, recovered in court not long ago $3,000 damages for injury to eyes from a burning coal that fell upon him. The iron shaving trouble is quite serious. When the brakes are put on the pressure on the shoes, as they call the iron that is thrown against and checks the wheels, is very great, because they have to make such short and quick stops. This friction tears off minute particles of iron, so small that the eye cannot perceive them, yet they are jagged and produce irritation.

"Some of the city oculists have special microscopes made to detect them, so frequent are the complaints, and these instruments require very powerful lenses and strong lights to detect them. Car drivers on the Third and Sixth Avenue roads are large sufferers from this trouble, so the professors at the Eye and Ear Hospital report."

The Cincinnati Convention.

Our last week's report gave most of the proceedings of the second day. Among the incidents was the following admirable letter from Senator Hawley of Connecticut, which was read before the Convention and received with great enthusiasm:

WASHINGTON, March 19, 1884.

DEAR SIR: Those patent bills pending before the Senate are not to become law by my vote, or if I can prevent it in any honorable way. My hope now is that the Senate bill, with the House bill, may be sent back to the Senate Committee on Patents, there to hear arguments which persons interested in patents are desirous of making. I have been wondering for two years that the patent industries of the United States were not more awake to the dangers which threaten this whole system. They are now bestirring themselves. I hope it is not too late.

Yours truly,
JOS. R. HAWLEY.

At the evening session the Convention adopted the following

PROTEST TO CONGRESS.

CINCINNATI, O., March 26, 1884.

Hon. George F. Edmunds, President *pro tem.*, U.S. Senate:

The American inventors, in convention assembled, desire, through you, to respectfully enter their solemn protest before the Senate against the passage of any measure tending to impair their rights as inventors or to deprive them of any of the legitimate fruits of their hard earned labor.

By order of the Convention.
J. S. ZERBE, Chairman.
CHAS. M. TRAVIS, Sec'y.

The Convention also adopted the following

APPEAL TO INVENTORS AND PATENTEES.

"*Resolved*, That a committee of three be appointed (the same to include the President of this Convention), whose duty it shall be to send a circular letter to inventors and patentees, urgently requesting them to write a private letter to their Senators and Representatives in Congress to vote and use their influence in all honorable ways to defeat all bills now pending before Congress, or which may be hereafter introduced, detrimental or in any way impairing their rights under patents."

The Constitution and By-Laws for the permanent organization were next read and adopted as a whole. The annual assessment on delegates was fixed at $2.

Some foolish fellow got in a set of resolutions that nobody but a lawyer shall represent an inventor before the Patent Office. They were laid on the table. This is on a par with the bill before Congress to compel patentees to pay $50 counsel fees to the defendant lawyer.

On the third and last day, March 27, the election of officers resulted as follows:

President, James S. Zerbe, Ohio; A. J. Nellis, Pennsylvania, First Vice-President.

C. M. Travis, Crawfordsville, Ind., Secretary.

John Fehrenbatch, Cincinnati, Assistant Secretary.

C. P. Lesher, Lansing, Mich., Treasurer.

J. J. Geghan, Cincinnati, Librarian.

The following Vice-Presidents were elected: M. Garland, of Bay City, Michigan; Josiah Kirby, Cincinnati, O.; J. S. Johnson, Mexico, Missouri; James T. Dongine, Chicago, Illinois; L. C. Huber, Huber, Kentucky; J. J. Johnson, Pittsburg, Pennsylvania; K. D. Davis, Cole City, Georgia; John Burleigh, Lawrence, Mass.; J. E. Baker, Madison, Wisconsin; C. P. Jacobs, Indianapolis, Indiana; Hon. Fred. Atwood, Winterport, Maine; Edward Barrath, Brooklyn, New York; Al. A. Yeager, Knoxville, Tennessee; W. C. Dodge, Washington, District of Columbia; William A. Harris, Providence, Rhode Island; Frederic Fries, Shenandoah, Iowa; Irving M. Scott, San Francisco, California; Mr. Knapp, Portland, Oregon; C. A. Campbell, Mississippi; E. V. Caldwell, Hoopersville, Alabama; C. F. Hyde, Ottawa, Kansas; George R. Platt, Louisiana; Hon. Clinton B. Davis, Higganum, Connecticut; C. A. Barvoios, Bennington, Vermont; A. J. Marberry, Cabot, Arkansas.

The Committee on Publication was appointed as follows: Dr. N. N. Horton, of Missouri, Chairman; Hon. Josiah Kirby; J. J. Johnson, Pennsylvania; J. S. Zerbe, A. J. Nellis, C. M. Travis, John Fehrenbatch, C. P. Lesher, J. J. Geghan.

Buffalo was selected as the next place for the annual convention, which takes place the second Tuesday in January, 1885.

SOME one says a good dressing for leather is made of one quart of vinegar, two ounces of spermaceti oil, and six ounces each of molasses and ivory black.

Colorado Resolutions.

We hope that inventors and manufacturers in all parts of the country will follow the spirited example of their brethren in Colorado, and lose no time in sending to Senators and Representatives an expression of their views. The following is from the Denver *Daily News* of March 22:

The inventors' convention called to meet in this city convened at the office of J. A. McAnulty yesterday afternoon.

General F. M. Case was elected president, and J. A. McAnulty secretary. A committee on resolutions was appointed by the chair, consisting of H. C. Lowry, H. W. Yonley, and J. A. McAnulty. Remarks were indulged in by a number of inventors present. The following resolutions were reported by the committee, which were unanimously adopted:

Resolved, That we, the inventors of Colorado in mass meeting assembled, view with alarm the hostile legislation threatened the patent laws of our country, as evidenced by bills already passed in the House, in which is shown an entire disregard, if not gross ignorance, of the protection that is required by inventors, who necessarily devote much time and thought and make large expenditures in the advancement of the practical interests of all men.

Resolved, That we are of the opinion that in no ordinary case can a reasonable profit or remuneration for the care, labor, and expense attendant upon the manufacture, introduction, and sale of any patented article be realized in any curtailment in the present life of a patent, being seventeen years.

Resolved, As citizens of a country which produces more inventions to the amount of population than any country in the known world, as constituents of a government whose only department that is self-sustaining is supported by the fees derived from patentees, the citizens of the United States should be the last to be deprived of the legitimate fruits of their brain labor by the acts of their own representatives to be stultified among the nations of the world as being the first and only government to remove all inducement to invention.

Resolved, That we appeal directly to our Senators and Congressmen, Hons. N. P. Hill and T. M. Bowen, J. B. Belford, and to the Hon. H. M. Teller, asking for diligent attention, persistent and outspoken opposition to any such legislation, or any interference whatever with our present patent laws.

Resolved, That a copy of these resolutions be forwarded to each of our representatives at Washington, to Secretary Teller, to the convention of inventors to be held at Cincinnati, March 25, and a copy furnished to each of the Denver daily papers.

Resolved, That this organization be considered permanent, at least during the present session of Congress, subject to call by the president, secretary, or three members. Adjourned.

The following are names of members signing the memorial: General F. M. Case, J. A. McAnulty, H. C. Lowry, H. W. Yonley, A. M. Wood, H. D. Preiser, Aaron Allen, W. Holland, Hadwin Swaim, G. M. Kitterman, J. P. Tryner, J. N. Best, George W. Gay, P. B. Hirsch, John W. Collins, Charles H. Murray, J. C. Phillips, James Scott, W. H. Lyman, E. R. Hubbard, M. Harrison, W. H. Rundall, Thomas D. Hughes, A. B. Evans, J. Lytle, John Berkey, Otto G. Patterson, J. H. Montgomery, Dennis Hughes, George Graves, S. E. Carson, J. Wilkelm, H. L. Rice, D. D. Shaw, W. A. Maloney, William Pim, John T. Fertig, James Goodlander.

Ideas of Locality.

An Ohio correspondent suggests that there is some relation between lost people describing a circle in their wanderings, from one limb being longer than another, and what is ordinarily spoken of as getting "turned around," when people traveling are confused as to the points of the compass, and attributes both phenomena to some peculiarity of the brain. Neither is owing to any "peculiarity" of the brain, but both are rather the necessary results of the normal operation of a sound mind. On the prairie as on the ocean, in the dark, or in strange places anywhere, one depends upon definite known bearings for fixing the points of the compass. When these pass out of sight on land it is generally by successive steps through surroundings less and less accurately observed, so that, particularly in journeying through the night, or for a period when the shifting of position as to external objects cannot be noted, the memory bears a constant impress of the direction last observed, and seeks to fit new surroundings thereto. The compass, or the sun and the stars, are the usual means for correcting the wrong impressions; but it is only by a subsequent mental process, which, with intermittent attention, is often a good deal protracted, that we are able, in some cases, to obtain correct ideas of locations into which we have been but newly introduced.

Alcohol and Digestion.

"We see many preparations of which the chief virtue is supposed to be that they contain *all* the digestive principles. These can be active only so far as they contain pepsin, and have no advantage over the simple drug.

It has also been shown that certain substances combined with pepsin in solution, render it inert. Alcohol is one, and even in moderation diminishes its action, while, in any quantity, the activity of pepsin is totally prevented. This is a point often lost sight of, and serves as a hint concerning the use of liquors at meals, by dyspeptics."—*Med. and Surg. Rep.*

© 1884 SCIENTIFIC AMERICAN, INC

Correspondence.

Leather Belting.

To the Editor of the Scientific American:

In SCIENTIFIC AMERICAN for March 8, 1884, question No. 32, in reply to J. W. in regard to the proper side of a leather belt to run next to pulley, you say *either* side, and then proceed to favor the grain side on account of uneven skiving, etc. As far as my experience goes, I find it best to put the *flesh* side next the pulley. I have had numerous arguments with other mechanics, but actual test in our shop is in favor of flesh side to pulley. We are running some belts one way and some another, and I find that running the grain side as a wearing surface has a tendency to cause it to crack.

Besides, wear on flesh side does not weaken the belt nearly as much as the same wear on grain side.

Our belts are all oak tanned, are from 4 inches to 10 inches in width, and are used without oil of any kind, in a wood-working establishment. The newest belt of all was put on with grain side next to pulley, and it has suffered more from effects of wear than any of the rest, and shows a tendency to crack, while those run with flesh side to pulley are free from cracks entirely.

I have found no difficulty from uneven skiving. The lengths of our belts run all the way from a 2 inch belt 7 feet long to a 10 inch belt 50 feet long. The one referred to as cracking is a 4 inch belt about 25 feet long, passing over a driver 24 inches in diameter, and pulley on saw mandrel 4½ inches.

E. J. KILMER.

Corpus Christi, Texas.

Touching the Tender Spot.

To the Editor of the Scientific American:

Seeing in your issue of February 2 a notice of a bill introduced by J. A. Anderson, of Kansas, for limiting the duration of patents to five years, I would beg to suggest to all inventors and others interested, each to write a letter in the form of a pledge, signed by themselves and as many of their friends as is possible to obtain, to the effect that any Congressman who would vote for such a bill must be blind to the best interests of their country; and for this reason the persons whose names were appended would feel it their duty to oppose all such persons, not only for re-election to Congress, but for *all offices* in the gift of the people. Such a letter sent from all parts of the country to Congressmen and Senators from their own immediate constituents would arouse them from their torpor, to state it in its mildest form.

J. F. WILLIAMS.

Reading, Pa.

A Novel Patent Act.

To the Editor of the Scientific American:

Seeing by your editorials and letters published in the SCIENTIFIC AMERICAN, that you invite correspondence in relation to the pending amendments to the patent laws (I think a more appropriate title would be "A Cowardly Thrust at Patentees"), I take the liberty to ask you to publish the following draught of a bill to be presented to Congress for their consideration:

"An act to relieve railroad corporations and others from vexatious litigation, when they happen to purchase stolen property, whether they knew it to be such or not.

"No 100,000. *Be it enacted, etc.*—On and after the passage of this act, any person purchasing any description of property, whether patented or otherwise, shall be, and is hereby, exempted from any penalty in consequence of said property having been stolen; and any attempt on the part of the owner to recover his property or prevent its use shall be deemed a misdemeanor, and fined seventeen dollars for the first offence, and, if repeated, shall in addition be liable to imprisonment for a term of seventeen years.

"*Be it further enacted:* That any person engaged in the manufacture and sale of an article patented by some one else shall be exempt from injunctions or writs of any kind, in order that he may fully enjoy the fruits of the other fellow's brains without let or hinderance, the other fellow being subject to the same penalty as the foregoing for any attempt at interference or injunctions.

"*And let it be further enacted:* That in view of the vast importance of our railroads—and the safety of the public traveling on the same—any inventions for securing safety, economy, and speed, now in existence or which shall hereafter be made, shall be free for their use, without money and without price.

"*And be it still further enacted:* That any person securing a patent, and after paying all expenses attending the same, shall keep strict account of all money received as well as paid out, deduct one from the other, and if the balance is found to be in his favor to the amount of seventeen dollars, his patent shall be public property, whether one year old or five; but in no case to be declared public property until his profits amount in the aggregate to seventeen dollars, whether it be one year or fifty.

"All laws or parts of laws that conflict with this act are hereby declared null and void."

I would suggest, also, that it would be in keeping with this act, as well as the acts that have already passed the House, that the judges having jurisdiction in such cases be members of the N. R. R. League.

CLAYTON DENN.

Frankford, March 31, 1884.

Ornamental Tree Planting.*

The judicious and tasteful planting of fruit and ornamental trees enhances the value of real estate more than an equal amount of money invested in any other way. It is not necessary to have a large extent of idle land in lawn or dooryard, or expensive drives and fancy walks, in order to give a country place an attractive appearance. A plain, neat yard, with a few trees and shrubs well selected and judiciously planted about the grounds, and properly kept, would often change the appearance of many a place from a neglected wilderness to that of a thrifty, comfortable home. It is not desirable to have an elaborate design to produce the best effect in small places. To give explicit rules for landscape gardening of universal applicability for amateurs to work by, would be impossible, but I offer the following suggestions, which may aid in perfecting a plan:

Most persons who have any fondness for trees or plants, when they once get started in horticulture operations, become very much interested. The great secrets of success in amateur landscape gardening are, first, to become interested, then to look and study and plan and contrive. A little ingenuity is also desirable, but it is not half so formidable or expensive an undertaking to lay out the grounds and plant a small lawn as many persons imagine.

Plant a few shade trees near the house, about ten feet from it, on the south and west sides, to screen it from the midday and afternoon sun. These should be rapid growers, as silver maple, or Carolina or balsam poplar. If these trees are planted about ten or fifteen feet from the house, they will give a very appreciable shade in three or four years, but they are not the most ornamental or desirable for permanent trees. Rapid growth is their recommendation, and they will be too close to the house to remain many years; therefore, plant some finer varieties about twenty-five or thirty feet off. For this, there are nothing better than sugar maple, Norway maple, horsechestnut, European chestnut, ash, *Magnolia acuminata*, red colchicum maple, sweet gum, willow leaf oak, and mossy cup oak. These trees should stand about thirty or forty feet apart, in order to have room to develop into perfect specimens; but it is often better to plant at half these distances, or plant some cheaper, rapid growing trees between them, in order to shade the place quicker, and then cut out alternate trees in a few years. There should be a vacant space directly in front of the house, affording an unobstructed view from the street or road. The trees which are necessary for shade on the front side should be trimmed up as they increase in size, so that there will be a view from the second story windows under their lower branches or between them.

Evergreen trees produce an effect in ornamental planting not to be obtained by any other means, and every large lawn should have an evergreen belt or hedge on one side at least. In exposed situations, a screen of large evergreens is of great value in protecting houses and out-buildings from cold northern winds. It is astonishing what a modifying influence a belt of tall evergreens, standing on the north and west side of buildings, will have in blustering, windy weather. The best varieties for this purpose are Norway spruce, hemlock spruce, silver fir, white pine, Scotch pine, American arbor vitæ, and *Retinospora obtusa*. It is not always essential that they should be planted in a straight row; it is sometimes preferable to plant in a curved or irregular line, or in a succession of clumps, so as to give the effect of a continuous background without the formal stiffness of a hedge row. As a general rule, evergreens do not appear to the best advantage in straight rows; they look better when grouped in clumps, or dotted about in a rather promiscuous manner. The larger varieties should not be planted any nearer to the verge of a carriage drive than fourteen feet. When planted in clumps, they are often set fifteen feet apart, with three or five trees of one variety together. At this distance they will attain their perfection in about fifteen years, and will then commence to deteriorate as the branches grow together. After the large shade trees and evergreens are planted, there will be a number of smaller evergreens and flowering shrubs needed for "filling in" the blank spaces. They should be planted in clumps of from three to ten or twelve, with an occasional single specimen in the smaller nooks.

The following are a few of the most desirable dwarf evergreens: *Arbor vitæ compacta, A. globosa*, Siberian, Hovey's golden, Tom Thumb, and George Peabody arbor vitæs. The last is a new golden variety of singular beauty, the hardiest and most distinct golden arbor vitæ yet introduced. *Retinospora plumosa aurea, R. plumosa, R. obtusa nana*, and *R. squarrosa* are not naturally dwarf trees, but they can be kept so by frequent shearing. If allowed to grow unchecked, they will attain considerable size. Irish, Swedish, and pyramidal junipers grow tall and slender, occupying but little room. The dwarf white pine is one of the prettiest small evergreens. It forms a compact, symmetrical bush, three or four feet high, and about equal diameter, presenting a dense mass of silvery green foliage. *Abies orientalis*, or eastern spruce, from the shores of the Black Sea, is a very handsome evergreen, of moderate size and very dense, compact habit. It is one of the neatest and most symmetrical of the spruce family, and appropriate for almost any situation.

Weeping trees are at present a fashionable feature in landscape gardening. The following are a few of the most desirable varieties: Weeping beech, cut-leaf weeping birch, and common weeping willow grow tall and form large trees. The Camperdown weeping elm and Kilmarnock weeping willow are dwarf trees, and never grow any higher than the point where grafted. *Abies inverta*, or weeping spruce, is the best weeping evergreen, and it is a very unique and effective tree in a lawn.

Hardy flowering shrubs develop more quickly than any other class of trees, and are therefore indispensable for filling in a new lawn, where it is desirable to get something to make a show as quickly as possible. There are also many nooks and corners that look bare at first, but which will eventually be occupied when the other trees are developed. Such places may be filled temporarily with some cheap shrubs, that can be thinned out or removed in a few years, as the trees encroach upon them. I name a few of the more recent introductions in this class of plants, all of which are hardy, free bloomers, and desirable for general cultivation, although not yet generally known because of their scarcity. They should be planted more extensively: *Cercis japonica*, or Japan Judas tree; *Cornus sanguinea*, or crimson dogwood; *Exochorda grandiflora;* purple-leafed filbert; Standish upright honeysuckle, the earliest and most fragrant variety; dwarf horsechestnut; *Viburnum plicatum*, or Japan snowball; *Weigela hortensis nivea*, or pure white monthly weigela. The purple beech is one of the most effective trees that can be planted in a lawn, particularly where it can be seen against a background of dark green foliage.

* S. C. Moon, in *Country Gentleman*.

The Economics of Disease.

There is one side of preventive medicine that may be urged upon the public with a strong chance of securing their attention, and that is the expensiveness of disease. In their individual cases they appreciate it well enough, and often howl loudly about loss of time and heavy bills at the doctor's and druggist's. But with the narrowness of view and selfishness of interest which generally characterize mankind, it is hard to get them to look at its cost in gross.

This may be estimated in several ways, and includes a number of factors. It has been calculated by statistical hygienists that of the cases of disease now current in civilized communities, about *one-third* could have been prevented by intelligent sanitation, personal or general. In our opinion this estimate is too low, rather than too high; but take it at one-third. Then the actual loss to these patients or their families is represented by one-third the whole amount paid doctors, druggists, nurses, etc., in a community, plus the loss of time, whatever that may be.

But this is only the first item in the bill of charges.

One-third of all the investment locked up in hospitals, dispensaries, asylums, homes, etc., could be placed to profitable and productive use were the laws of health observed.

Much more than this; numerous limited localities, vast tracts of fertile land, now shunned or but partly tilled, because of their ill repute on the score of health, would be doubled, quadrupled, in selling value and producing power, were they made free from the poisons which infest them. Millions of acres of the finest soil in the United States are lying idle by reason of the paludal poisons which are generated about them. Yet there is strong testimony that systematic action on the large scale can overcome these miasms.

We have spoken only of disease, but we must also take into account the sequelæ of disease in destroying ability to work, and thus casting the heavy expenses of permanent invalidism on the family or the commonwealth, or by a fatal result depriving the community of a life which would have possessed a value as capital applied to the production of wealth.

This has been the subject of calculation by political economists in England and Germany, and in both countries they have reached the conclusion that the value of an unskilled laborer, at twenty-five years of age, to his country is $1,200. In other words, this is the average sum which such a person will contribute during his life to the wealth of the community in which he lives. Now, if we suppose one-third the deaths in a community are preventable, we can readily see how much richer the community would be were it to exercise the necessary prophylaxis.

These are but a few of the practical considerations to which this subject leads, but they will serve as hints how strong a case may be made of this side of sanitation.—*Med. and Surg. Reporter.*

Refining of Shellac.

BY E. L. ANDES.

The crude shellac is refined in the following way: One and a half kilos. of soda are dissolved in 45 liters of water contained in a small boiler or kettle; 5 kilos. of the crude shellac are added in small quantities at a time. This turbid solution has the characteristic odor of shellac and a violet-red color. The liquid is boiled for a few minutes, and, while hot, a wooden air-tight cover is cemented on the vessel. When the liquid is quite cold the cover is removed, and the thin cake of fat which is found on the surface is separated. The solution is filtered through linen, the clear filtrate slowly decomposed with dilute sulphuric acid, and the resulting shellac washed with water until no acid reaction remains. The washed resin is now pressed and melted in boiling water, when it can be shaped with the fingers. This shellac is cooled in water containing glycerol, and when hard is dried. The refined shellac forms yellowish-white, glistening tufts or bars, which, when dry, are yellowish-brown; it should entirely dissolve in alcohol.

© 1884 SCIENTIFIC AMERICAN, INC

Conflagration Dangers in Large Cities.

At a recent meeting of the American Society of Civil Engineers, in this city, a paper by E. B. Dorsey, C.E., on "The Comparative Liability to and Danger from Conflagrations in New York and London" was read by the author.

The following were among the reasons given for the comparatively smaller number of fires in London as compared with American cities, and especially with New York. The comparatively damp climate of London, which prevents sparks or weak flames from igniting wood; the much higher temperature of the winter months, and consequently the smaller number of domestic fires. Statistics were given showing that lower temperature always largely increased the number of fires. The population of New York south of 40th Street is more dense than in an equal area of London, New York averaging 208 persons per acre, and London 191½ per acre for the same area. New York averages for the same area 16⅓ persons per dwelling. Another comparison of about 750 acres of the most densely populated portions of London and New York gives for London 249 persons per acre, and for New York 352 persons. The size of the houses in London is in general considerably less than in New York. Many London houses do not exceed 15 feet wide, 25 feet deep, and 22 feet high, and a very large number do not exceed 16 feet wide, 30 feet deep, and 40 feet high. All the London houses have fireproof roofs, and in all cases there is proportionately much less wood and more brick or stone than in New York buildings. There are also fewer and smaller windows than in New York. The walls are short, low, and generally well tied together, and so built that they will not fall after the little woodwork in them has been burnt, thus rendering it easier to confine a fire to the house in which it begins. There are no wooden roofs on buildings, and but little wood in the yards, in fences, or outbuildings. The ash barrel or ash box, so frequent a cause in New York, is unknown in London, each house being required to have a vault built of masonry for ashes. Lumber yards, large stables, carpenter shops, furniture makers, wooden manufacturers, places for storage, the manufacture of combustible material, are not found in the thickly built portions of London. The river Thames and the parks divide London in such a way as to greatly aid in preventing the spread of conflagrations. The numerous railroads running into London form effective barriers against the spread of fires. These railroads, with the exception of the Metropolitan and District Underground roads, are built upon heavy viaducts of brick or earthen embankments, not less than 60 feet wide, or are in open cuts not less than 80 feet wide. There are also many wide streets in London and numerous squares, crescents, church yards, and private grounds.

Glucose in Leather.

According to the *Shoe and Leather Review*, the falsification of the weight of leather by adding glucose, or grape sugar, appears to be carried on rather extensively in Germany, and the shoe trade societies are taking steps to protect themselves from the imposition. A simple test is recommended, which consists in placing pieces of the leather in water for the space of twenty-four hours, when the glucose will be dissolved by the water, and the result will be a thick, sirupy liquid. When two pieces of the leather are placed together and left in that position for a time, it will be found difficult to separate them, as the gummy exudations will stick them together. It is stated that some samples of sole leather were found to contain as high as 30 to 40 per cent of extra weight. Another test recommended is to cut off small pieces of the leather, and, wrapping them up in a damp cloth, lay them away for a few days in a temperate place. If the leather is adulterated, the pieces will be found to be stuck together, and surrounded by a sirupy substance in proportion to the quantity of the adulterant used; and the peculiarity about leather treated with grape sugar is that, after wetting, it is difficult to dry, and resembles gutta percha or untanned leather more than the genuine article.

THE "setting of gypsum" is the result of two distinct phenomena. On the one hand, portions of anhydrous calcium sulphate, when moistened with water, dissolve as they are hydrated, forming a supersaturated solution. Again, this same solution deposits crystals of the hydrated sulphate, gradually augment in bulk, and unite together.

IMPROVED WARPING MACHINE.

Fig. 1 is a perspective view of the warping machine as constructed by Messrs. Howard & Bullough, Fig. 2 is a side elevation, and Fig. 3 a sectional plan, which indicates more clearly the improvements adopted. The presence of

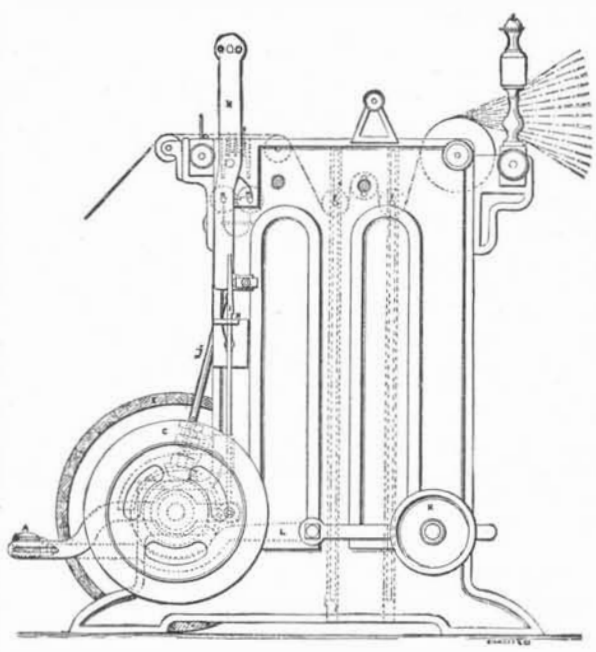


Fig. 2.—BEAMING OR WARPING MACHINE.

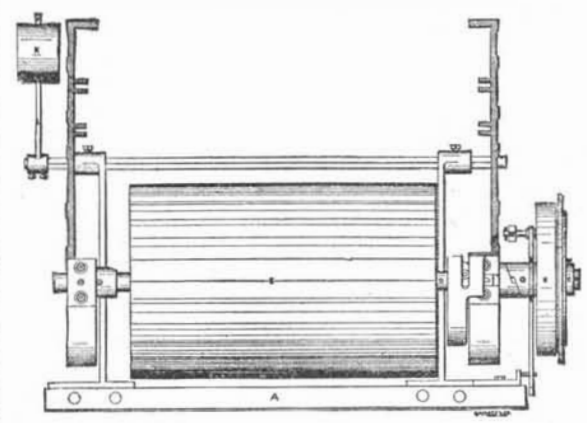


Fig. 3.—BEAMING OR WARPING MACHINE.

a stop motion renders a large number of falling rods unnecessary. Two only are required (*bb*, Fig. 2) to take up the slack due to over-running of the bobbins on a stoppage. They also serve to reduce the strain on the yarn due to the inertia of the bobbins on starting again, the tension being applied gradually as the falling rods are lifted to their normal working position. Upon the shaft, D, is fixed the surface drum, E. The warper's beam that rests upon it is not shown, but the course of the warp toward it is indicated by the dotted lines. The self-stoppage is effected as follows: The two rollers, M M, are of equal length to the width of the frame, and revolve in contact with the right-hand roller, being driven by means of inclined shaft, J, and bevel wheels from the surface drum shaft, D. The threads are about 3 inches above the rollers, as are also three slots in the table of the machine. These slots contain a set of fallers or staples of ∩ shape, each staple, I (see Fig. 2), hanging upon its own thread, and being kept up thereby. Suppose a thread fails; the staple it supports falls into the nip of the rollers and separates them, pushing the left-hand roller toward the left. The small movement due to the entry of the faller into the nip is multiplied at the foot of the lever, N, to an extent sufficient to knock the notch of trigger, I, off its support, H. When this occurs the weight, K, which is kept up by the trigger, is allowed to fall, in doing which it disengages the driving motion and causes the stop.

This motion, as will be understood, is very rapid in its action. The only time lost before the driving is knocked off is that taken up by a faller falling 3 or 4 inches, as the case may be, say about one-tenth of a second, and immediately it is in the nip the slightest revolution of the rollers causes their separation and stoppage of the warping before the broken end has reached the beam. The faller drops into a trough below, and no further notice is taken of it for the time being. When the end is pieced and the machine again started, which is done by depressing the treadle, A, the minder places another faller upon that end, and so on in every case, the fallers that from breakages accumulate in the trough being collected from time to time and used over again. The choking of the slots by the accumulation of floss is prevented by the mode of suspending the fallers. The threads run in close proximity to the top of that part of the frame containing the slots, and consequently the fallers are allowed to sink for their full depth into the slits and away from possible contact with floss, only the very tops being exposed, and the collection of fibers at these points is practically impossible, the threads rushing in close proximity to the surface, effectually sweeping them away as they fall from the yarn. The machine is driven by the belt pulley, B, which, when the machine is stopped, runs loose on the shaft. By depressing the treadle, the inclined surface of the clutch or cam forces the pulley against the friction plate, C, and causes the surface drum to be gradually set in motion, in this way also easing the strain on the yarn.

An improvement has been added to the Singleton machine by Mr. Tweedale, of the firm of Messrs. Howard & Bullough, that should be mentioned. It consists in applying a clutch (as shown in dotted lines) on the inclined shaft, J, that drives the stop motion rollers. When the machine is knocked off, this clutch is automatically disengaged at the same time. This allows the beam to be turned back for finding a lost end, when necessary, with far greater ease than in the old Singleton, because the rollers are not now turned by the operative. When the treadle is depressed and the machine started, the clutch is simultaneously put into gear. The roller on the right in Fig. 2, that the yarn first passes over after leaving the creel, is a measuring roller, 18 inches, or half a yard, in circumference, and it is made to actuate a stop motion when certain lengths have been wound. For instance, it is usual for this motion to be adjusted to stop for every "wrap" of say 3,500 yards, as an indication to the minder that this length has been wound, the warper's beam containing several "wraps" (about four or five) when full.

It only remains to add that the commonest width of machine is ⅜, or 54 inches wide inside of warp beam flanges, but they have been made on Singleton's principle in all widths up to ¼, or 108 inches wide inside of warp beam flanges, and this machine has so much merit in practice that Messrs. Howard & Bullough have made the astonishing number of 7,000, and this number is being added to at a rapid rate.—*Textile Manufacturer.*

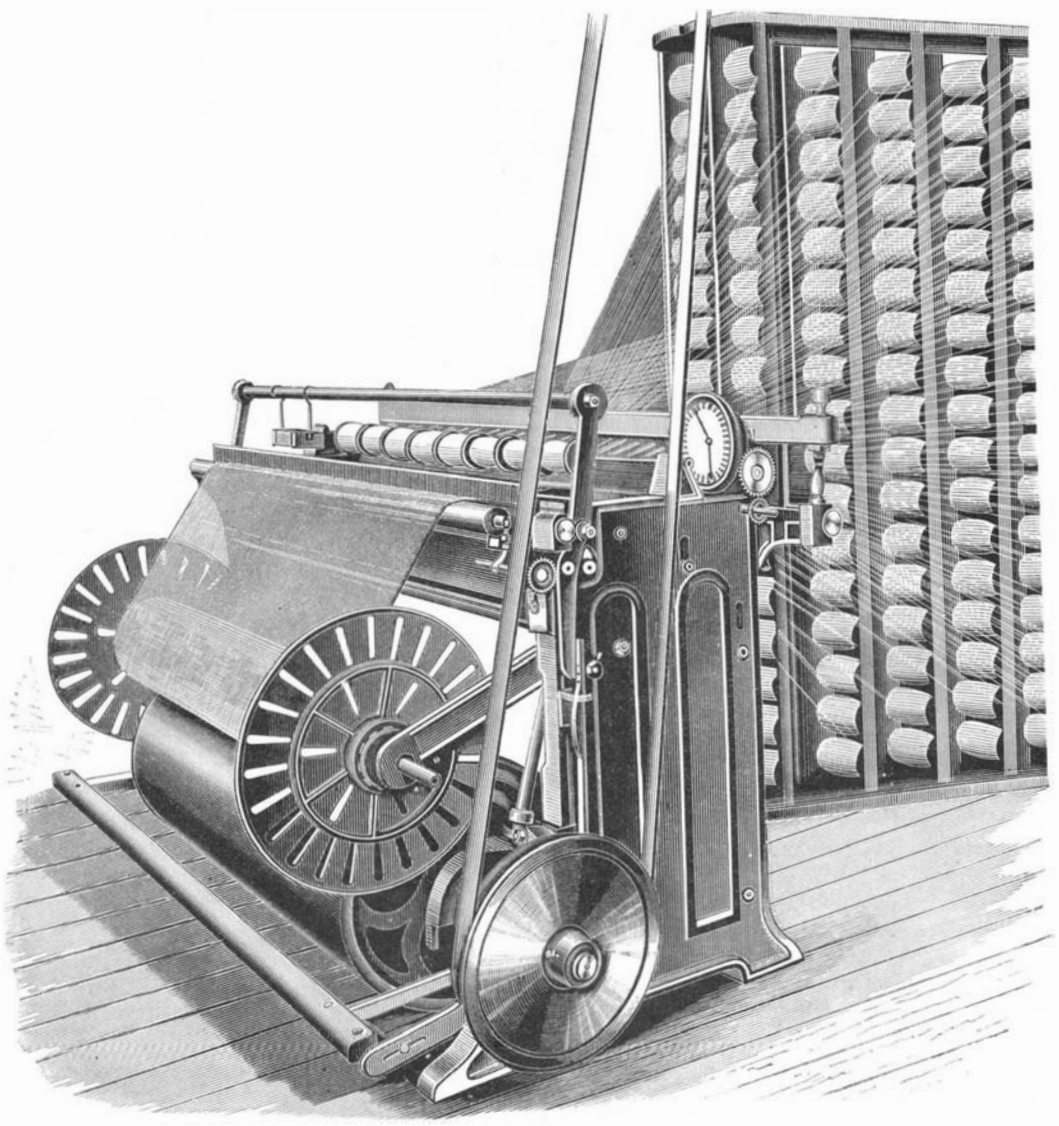


Fig. 1.—HOWARD & BULLOUGH'S BEAMING OR WARPING MACHINE.

Softening Water.

An account is given in *The Engineer* of a method of softening water followed in some industrial establishments in Germany. The principle of the process is based upon the fact that heated and hydrated oxide of magnesia readily absorbs the free carbonic acid of natural water; and by thus depriving the water of its dissolved gas,

© 1884 SCIENTIFIC AMERICAN, INC

precipitates the carbonate of lime previously held in solution. The magnesia then dissolves, and unites with the bicarbonate of magnesia in the water. At first, water thus softened was suspected of attacking old boilers fed with it, and filling them with mud. It was afterward found, however, that it was the old hard scale that had been dissolved into mud; thus exposing any weak places and leaks that might have been corroded over before the purified water was introduced. The water thus treated has an alkaline reaction, and counteracts any possible acid corrosion. At first, stirring was considered an indispensable part of the process; but, eventually, it was found that straining the water, through an excess of the hydrated oxide of magnesia spread on a filtering medium, would produce the desired effect without further trouble. By mixing proportionate quantities of finely powdered oxide of magnesia and sawdust with water, and subsequent heating, hydrated oxide of magnesia will be formed throughout the whole mass. This preparation forms a most valuable filtering material. Metal cylinders are tightly filled with the mixture, and used as filters; and they are efficient, not only in cleaning dirty water, but also in softening it, for the carbonate of lime crystallizes directly upon the sawdust.

CENTRAL FRANCE UNDER THE CLOUDS.

It frequently happens that the plateaus of the center of France are covered with fogs, and even with a stratum of clouds that descend as far as the ground, while the mountains and elevated plains are enjoying a clear sky and atmosphere. Such a phenomenon has just again occurred between the 25th and 31st of December, 1883, and between the 18th and 24th of January of the present year. The annexed engraving gives an exact idea of the extraordinary spectacle as seen at the time from the top of the Puy de Dome.

The formation of this low stratum of clouds is due to atmospheric whirlwinds that have their origin near the Gulf of Genoa, and that remain afterward upon the Mediterranean. In order to prove this, let us go back a little. On the 28th and 29th of October, 1883, the winds from the southwest, under the influence of areas of low pressure that were passing over the Channel, blew tempestuously in mountain and plain, and carried along as they did so an excess of moisture that resolved itself into a drizzling rain. On the 30th, a zone of high pressure had established itself upon the east coast of Europe, and a gyratory motion made its appearance over the Gulf of Genoa. As always happens, the central plateau immediately came under the influence of the latter; the wind fell in the plain, and, preserving its force, turned to the northwest, at the altitude of the summit of the Puy de Dome. This state of things kept up until the 12th of November, and caused a few falls of snow. Low pressures succeeded over the Western Mediterranean, and the upper wind oscillated from northeast to southwest, and frequently blew strongly.

Eight times during this period it was possible from the summit of the Puy de Dome to enjoy the spectacle of a sea of clouds covering the plains, nothing being seen but the summits of the Puys, the culminating points of the Forez chain and of Mount Dore, like islands here and there.

On the 13th, the zone of strong pressures that had been prevailing over Western Europe since the 30th of October was driven toward the south. The gyratory motions upon the Mediterranean ceased, the phenomenon disappeared, and, up to the 21st, a series of tempests agitated the atmosphere of the country, under the influence of strong depressions that entered England or Brittany and afterward traversed the north of Europe. The stratum of clouds reappeared on the 21st and 22d, after a fall of snow, and this reappearance coincided again with the existence of a new barometric minimum in the latitude of the Gulf of Genoa. From the 25th to the 27th, Central France was again free from its stratum of clouds, because a zone of strong pressure had established itself over Italy and Southern France, while great cyclonic disturbances were passing over England. But, on the 28th, these movements became weaker, and went off through the north of Europe. Then a slight center of depression manifested itself anew over the Mediterranean, and the stratum of clouds again formed.

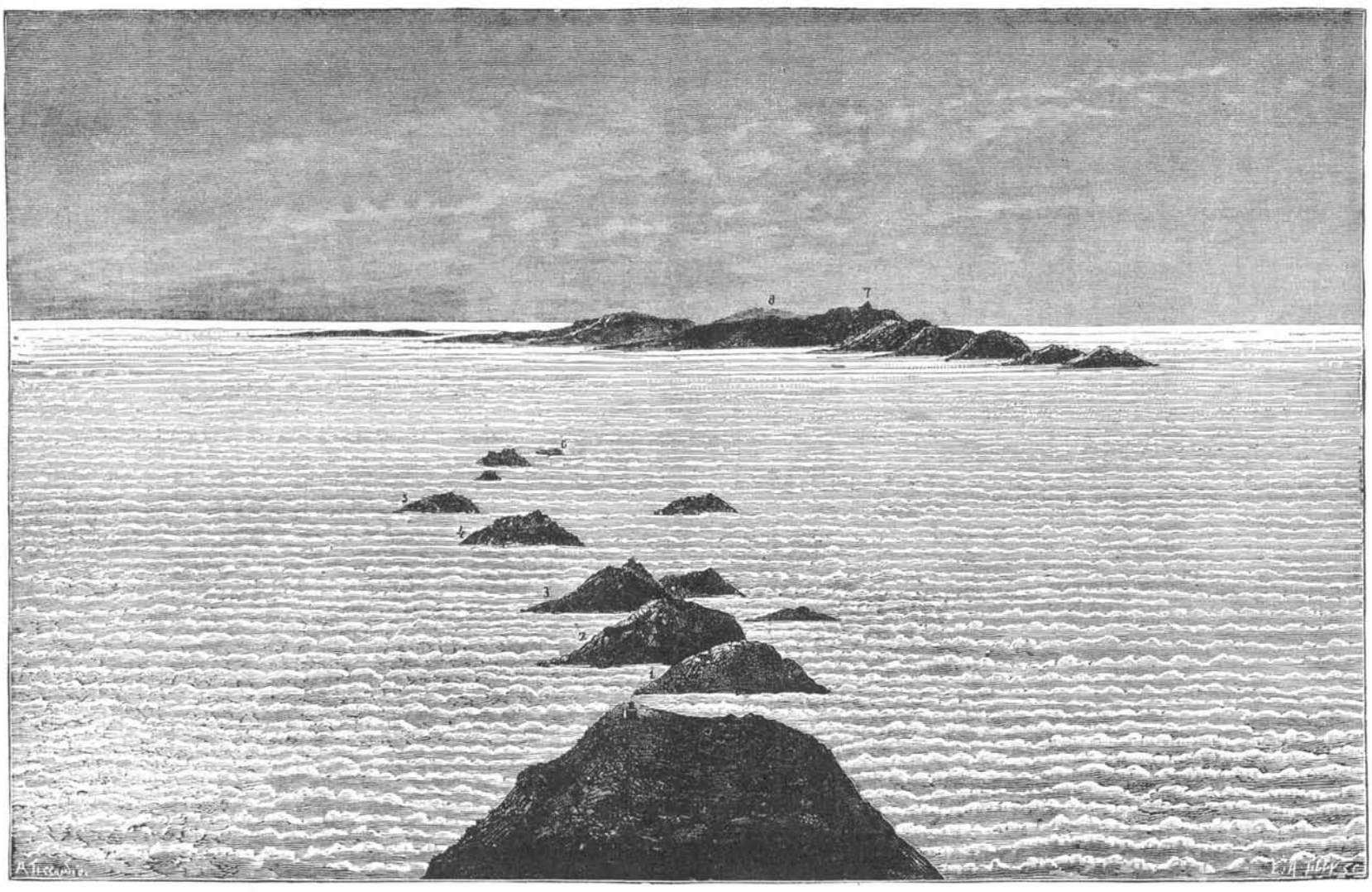
Since I have observed this phenomenon, it has always occurred under the same conditions; so its formation and disappearance may be foretold. Thus, on the 22d of January last I was able to announce that the clouds and fog that had lasted since the 18th would disappear the next day, on the 23d; and this really happened.

The stratum of clouds, which envelops us like a winding sheet and which involves a portion of France, and doubtless many other countries, in a misty and unwholesome atmosphere, is always thin, although its opacity is very great. Its lower surface, when it does not graze the ground, may rise to 1,500 or 2,200 feet, and is then perceptibly plane and horizontal and appears to be uniformly gray. Its upper surface, which is of a dazzling white, is sometimes mamillated, sometimes jagged, and sometimes plowed up into long parallel furrows that make it resemble the surface of a rolling sea. It oscillates between 2,200 feet and 3,800 feet.

The thickness of the stratum varies, then, between 625 and 2,200 feet. Sometimes it is only necessary to ascend the declivities in the vicinity of Clermont in order to emerge from the cold and damp clouds, and to get into the sunshine and breathe a pure and mild atmosphere.

In the midst of these clouds abundant deposits of hoar frost are observed to be frequent, and below them there sometimes falls snow or a drizzling rain. It is especially during the existence of this stratum of clouds that a comparison of temperature observed in the two stations of the Observatory of the Puy de Dome presents great anomalies. They are then very pronounced, because the upper surface of the clouds is in contact with very dry air, and there occurs a very active evaporation; because the warm currents can prevail at the altitude of the summit of the Puy de Dome; and because near the ground the air, which is already chilled when the clouds form, is entirely shielded for several days from the calorific action of the sun.

On the 28th of last December, toward 7 o'clock in the morning, the thermometer marked 0° at Clermont, and +7·9° at the summit of the Puy de Dome. This fact is remarkable enough; but on the 26th of December, 1879, the temperature ascertained at the Puy de Dome was +4 7°, while at Clermont it was 15·6° above zero. Again, it should be remarked that the mean temperature at the Puy de Dome (4,600 feet) being about 4°, while at Clermont (1,200 feet) it is 10°, the inversion is still greater than it at first appears, reaching really 26°.—*M. Plumandon, in La Nature.*



SEA OF CLOUDS OBSERVED FROM THE SUMMIT OF THE PUY DE DOME FRANCE.

The Theory of Magnetism.

At a recent meeting of the Royal Institution, Professor D. E. Hughes gave a lecture on "The Theory of Magnetism," illustrated by experiments. The mechanical theory of magnetism may be deemed to be the proper style and title of that brought forward by the lecturer. The phenomena of magnetism he explains by a simple rotation of the molecules of iron, as well as of all metals; nay, more, of all matter—solid, liquid, gaseous, or ether. All matter, according to his views, has inherent magnetic power, varying in degree in molecules of different nature, but not to any great extent.

The lecturer demonstrated each portion of his theory by experiment, so that the effects were visible to the audience. The striking effects of vibration, torsion, or mechanical strain upon the destruction or creation of manifest magnetism he showed in a variety of ways, the soft iron obeying the slightest mechanical tremor, while hard iron or steel resisted the most violent treatment. The molecules of the same bar behaved with extreme freedom, as in the instance of soft iron, but when a slight strain was put upon them, as when slightly bent, like an archer's bow, the bar became as rigid as steel, and mechanical action had no longer any effect.

A detailed account was given of the lecturer's researches upon the atmosphere, in the course of which he has discovered that it has a saturating point, like iron, and that it is just like iron itself. This was illustrated by striking experiments upon the magnetism of the atmosphere as compared with that of iron, and with the effects of vibrations in allowing freedom of motion to magnetic conduction in iron, by means of which a magnetic pole was pushed forward to four times its previous distance. Heat and electricity produced like effects, whence Professor Hughes drew the conclusion that these three forces, each allowing molecular freedom when frictional resistance is lessened, must have a like origin, and that electrical currents can be fairly classed with heat as a mode of motion. When a bar of soft iron is strongly magnetized, as in the instance of an electromagnet, it returns, like a spring, to a neutral state upon the cessation of the inducing force.

This well known fact has long remained a mystery. All theories of magnetism up to the present time supposed that the molecules became, on the removal of the induced current, mixed or heterogeneous. Professor Hughes believes he has made a great discovery in having solved this problem, leaving no mystery any longer, as the demonstration which he will bring forward this week before the Royal Society will reduce the matter within the domain of absolute fact. He proved his case before his audience at the Royal Institution in a less formal way, but quite as effectually, rendering a bar of iron sensibly neutral or polarized at will by simply turning it upside down. The mechanical inertia of the molecules was demonstrated by magnetizing a bar,

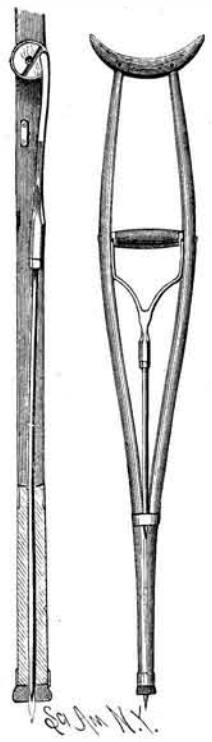
© 1884 SCIENTIFIC AMERICAN, INC

and then changing its polarity by the earth's influence alone. The inertia of magnetism and of electricity was illustrated by two bars of diverse hardness.

Having dealt with other points of great interest, the lecturer concluded by saying that scientific men are agreed that heat is a mode of motion, and that the molecules of the most solid bar of iron can move in a certain space with comparative freedom, the oscillations being greatly increased with every rise in temperature. If, as already well known, the molecules can move in all planes, then there could be no valid objection to the idea of their rotation, in fact, they were known to rotate in the act of crystallization. Thus, according to Professor Hughes, magnetism is an endowment of every atom of matter.

AN IMPROVED CRUTCH.

The accompanying illustration represents a crutch recently patented by Mr. W. H. D. Ludlow, of La Porte City, Iowa. Through a hole in the lower end of the crutch passes a steel rod which extends up between the branches, terminating in a screw socket that receives a screw stem attached to the lower end of a yoke, and provided with a jam nut. With this construction the prod may be turned, so as to project more or less from the end of the crutch, as required by circumstances. The two upper ends of the yoke are connected eccentrically to the ends of the handhold, which is swiveled, so that when turned by the hand of the user the prod will be projected from or withdrawn into the end of the crutch. Upon the inside edges of the branches of the crutch are fastened two lugs, so fixed in relation to the yoke that when the latter is turned past the dead center, in rotating the handhold to project the point, the sides of the yoke will strike against the lugs, keeping the yoke in place, so that pressure on the prod cannot drive it back until the handhold is reversed. In the crutch made in accordance with this plan either the rubber end or the prod may be used, as circumstances may require, the change from one to the other being instantly effected by turning the handhold. The cut shows a front view and an enlarged section.



Bleaching and Oxidizing Cotton Goods with Chloride of Lime.

BY H. SCHMID.

Vegetable fibers can be converted, by the action of chemical agents, into a condition resembling wool or other animal fiber, in which state they take the dye without previous mordanting. A new method of accomplishing this, discovered by G. Witz, of Rouen, is based upon the action of oxidizing agents, in acid or neutral solutions, upon textile fibers.

Witz's investigations have put an end to one of the most serious accidents in the bleaching process. The practical bleacher is familiar with the fact that in steaming bleached goods spots not infrequently make their appearance, which are either the same color as the unbleached goods were, or have a reddish yellow color. Witz has proved that they are caused by too strong a bleaching bath and by being left in it too long, since chloride of lime, not uniformly applied, and aided by the action of air and light, may prove very destructive. Hitherto it has been customary, if such spots appeared on steaming, to increase the strength of the chloride of lime bath, which likewise increased its destructive action. The rotting of the fiber caused by an inordinate use of bleaching material was attributed to its imperfect removal, and they sought to remedy the evil, and frequently in vain, by the use of antichlor. Witz substitutes a clear solution of chloride of lime not exceeding 0·5° B. in concentration, and gives more effect to the operation by boiling with water and washing.

Witz investigated the oxidation or animalization of the fiber with a 4 per cent solution of chloride of lime, using methylen blue as test reagent. Strips of cotton were suspended for a long time partially in and partially out of the chloride of lime solution. After washing and removing the chlorine with an alkaline bisulphite and acids, it was dyed with methylen blue. The portion that was in the bleaching solution took a faint blue color, while that which was just above took a dark blue color, showing that the carbonic acid in the atmosphere played an important part in setting free the hypochlorous acid which oxidized the cellular tissue. Light and warmth have a favorable effect on the oxidizing power of the chloride of lime.

The oxidized cotton not merely absorbs the aniline dyes, but it decomposes the neutral salts of iron and alumina, fixing the bases. Vanadium especially is precipitated on the oxidized fiber, as is readily recognized by the ease with which aniline black is formed, even when the vanadium solutions are extremely dilute. The action of air upon cotton for years will produce the same effect as the hypochlorite as proved by the test with methylen blue. Light assists the action of the air. Hydrogen peroxide and ozone play the same part, but ozone attacks the fiber least in proportion to the beauty of the blue produced. Even wool and silk, after being subjected to the action of ozone, take a deeper color in the dye bath than in their normal condition.

To utilize the new reaction for calico printing, Witz uses the chlorate instead of the hypochlorite. He prints upon the cloth with a saturated solution of potassium chlorate mixed with a little less hydrochloric acid than is required to liberate all the chlorine, thickened with gum tragacanth, and containing 10 milligrams of vanadium in a liter. Chromates can also be substituted for hypochlorites.

Dyestuffs can be divided into two classes as regards their behavior toward the oxidized cotton—attracted and repelled. The latter dye cotton that has not been oxidized better than that which has; to this class belong the acid azo-dyes, like Ponceau and Bordeaux, and acid dyes of the nature of the phenols, phthaleine, and the amine colors that have acquired acid characters by the introduction of acid groups. The dyes that have basic characters, like rosaniline, constitute the attracted colors.

The dark side of the subject is that these dyes which have been fixed without mordants are unable to resist the action of even the feeblest alkalies, such as the soap bath.

Witz's process is not limited to cotton, wood fiber, silk, and wool, but even horn, hair, scales, skin, feathers, sponges, and bones can be so changed as to have the same qualities as the other fibers with respect to dyes.—*Dingl. Jour.*

A New Test for Lead.

BY A. WYNTER BLYTH, M.R.C.S.

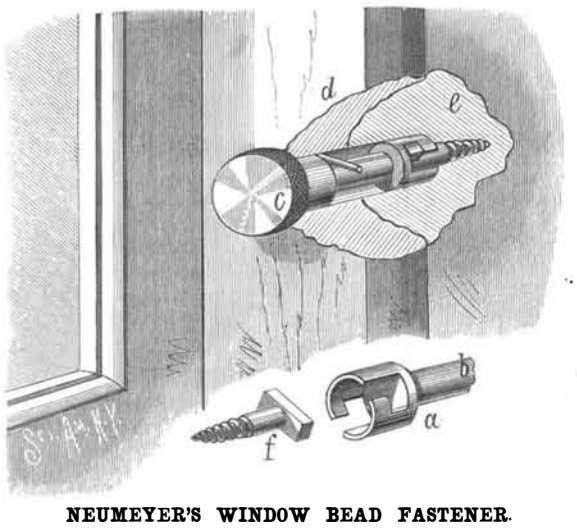
A solution of cochineal is prepared by boiling the ordinary commercial cochineal in water, filtering, and then adding sufficient strong alcohol to insure its preservation from mould. A few drops of this solution added to a colorless neutral or alkaline solution containing dissolved lead, strikes a deep mauve blue to a red with a faint blue tinge, according to the amount of lead present. The test will distinctly indicate a tenth of a grain of lead per gallon in ordinary drinking water, and, by comparison with a solution free from lead, much smaller quantities are indicated.

In searching for traces of lead in water, it is convenient to take two porcelain dishes; into the one place 100 c. c. of the water to be examined, and into the other a solution of carbonate of lime in carbonic acid water, known to be lead free, and approximatively of the same hardness as the water to be examined; then add to each an equal bulk of the coloring matter in quantity sufficient to distinctly tinge the water; the colors may now be compared; the slightest blue tint will be either due to lead or copper; for copper in very dilute solutions gives a similar tint, but in solutions of 1 to 1,000 or stronger the hue is so different as to differentiate the two metals.

The method is within certain limits applicable for quantitative purposes on the usual colorimetric principles. As a qualitative test, it is superior to hydric sulphide and more convenient.—*Analyst.*

WINDOW BEAD FASTENER.

The engraving represents an invention recently patented by Mr. H. F. Neumeyer, of Macungie, Pa., by the use of which



NEUMEYER'S WINDOW BEAD FASTENER.

window beads can be fastened to the casing in such a way that they can be removed, and replaced and fastened readily. The bolt, *b*, is provided at one end with a milled head, *c*, and at the opposite end with a tubular head, *a*, having a transverse slit forming two prongs, each of which is recessed to form hook prongs as shown in the detached figures. At the inner end of a hole through the bead and into the casing, is held a screw, *f*, which is provided with a cross head that passes between the prongs, and into the notches of the hooks on the head, *a*. The withdrawal of the bolt is prevented by a brad driven through the bead.

After the bead has been placed against the casing, the bolt is pushed inward until the head on the screw passes between the hook shanks of the head, *a*. The bolt is then given a quarter turn, so as to cause the ends of the screw head to enter the notches of the hooks. The bead can thus be fastened on or released from the casing very easily and rapidly.

A Safety Rail Fastening.

The drawing of railroad spikes, from the springing of the rails under the wear of engines and trains, is the cause of many accidents. An invention which promises to obviate this difficulty has been made by Capt. Thomas J. Bush, of Lexington, Ky., interlocking bolts being used instead of spikes. Holes are bored in the tie on either side of the rail where the spikes would go, at such angles as to cross each other beneath the rail in the form of the letter X; the bolts have at their upper ends screw threads, which hold nuts squarely down on the flange of the rail, and one of the bolts has a slot, into which the beveled lower end of the other bolt causes a shoulder thereon to lock, and thus bind the rail firmly to the tie. A number of railroads are now experimenting with these bolts, among them the New York Elevated, the N. Y. Central, the Erie, the Pennsylvania, the West Shore, and the New York City and Northern.

RIPPING ATTACHMENT FOR SCISSORS.

Riveted to the inner edge of one of the handles of a pair of scissors and to the loop is a knife casing, in one end of which is pivoted the blade, which is held in the desired position by the usual form of spring at the back of the casing. When the blade is to be used for ripping seams, etc., the scissors are opened as shown in Fig. 2, so that the cutting edges of the blades will be as far apart as possible, and the knife is opened so as to project from the end of the handle. The attachment does not interfere in any way with the use of the scissors, as it is very compact when the knife is shut. This invention has been patented by Francis S. Loockerman, of Manokin, Md.

Forms of Planer Tools.

The form of the cutting portion of tools used on iron has much to do with their useful life and the result of their work. Some planer men in the machine shop will not use for roughing any but a diamond point tool; others do all their "first" work with a round-nose or U tool, and both finish with a square-nose tool. There is a planer tool that should be known and encouraged, that can be used either as a roughing or as a finishing tool. It may be described as a side tool for the lathe, curved around to make a "spoon" form, as understood by lathe and planer men. The tool takes the weight and pressure of the cut at its lowest and strongest point, and the forward uprising portion cleans the surface way, while the backward uprising portion finishes the deep cut. Properly made and properly used, such a cutter is as good as two—if not three—cutters in one. A practical, experienced planer man said recently, that he had used a tool of this shape on cast iron, with a one-eighth of an inch feed, for four hours without grinding, and got better work as to exactness than was possible with a diamond point or a round-nose tool.

The Attempt to Change the Patent Laws.

"Every important manufacturing concern from Maine to California is experiencing the withering effects of this uncalled for agitation. Fools may roll back and stay the tide of invention which is sweeping over the land, that may destroy our industrial progress, and bring ruin and havoc by their action, but they can give no recompense in return for their deeds of vandalism. Is it not time that manufacturers, inventors, indeed business men of intelligence everywhere, should let their voices be heard in this matter? Every senator should be fairly deluged with letters of remonstrance against the bills now before the Senate. And these letters should all be carefully written. Senators ought to know the feeling of the people in relation to these measures, and good sound reasons should be urged for their defeat.

This is a matter of vital importance, and no time should be lost in demonstrating to Congress that the American nation is not ready or willing to do injustice to our inventors even to accommodate the crowds of moonshiners or infringers, who, lacking brains to invent anything themselves, are only too willing to purloin the discoveries of those who can."—*Industrial World.*

NEW subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT, who may desire to have complete volumes, can have the back numbers of either paper sent to them to the commencement of this year. Bound volumes of the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT for 1883 may be had at this office, or obtained through news agents.

All the volumes of the SCIENTIFIC AMERICAN SUPPLEMENT from its commencement, bound or in paper covers, may be had as above.

© 1884 SCIENTIFIC AMERICAN, INC

ENGINEERING INVENTIONS.

A rotary engine has been patented by Mr. John T. Davis, of New York city. The construction covers two hemispheres and two cones arranged therein, with a slot through their centers for the piston, the cones forcing the piston around the sphere to give motion to the shafts, the steam being cut off at the largest area of the steam chamber by the other half of the piston passing through the same point.

MECHANICAL INVENTIONS.

An engraving machine has been patented by Mr. Ira R. Beam, of Dryden, N. Y. It is for engraving jewelry, watches, plates, etc., and has holding devices with wide range of adjustment, improved construction and arrangement of the engraving tool and the apparatus for working it, and also for holding the copy, from which the movements of the engraving tool are directed by a style.

A friction pulley has been patented by Mr. Volney W. Mason, of Providence, R. I. A counter balance is combined with the shoe, the latter being made with an attached counter balance, and there is a method for throwing shoes in and out of contact with the pulley, the principal object of the invention being to counteract the effect of centrifugal force in the working parts of friction pulleys.

AGRICULTURAL INVENTIONS.

An improved seed planter has been patented by Mr. William L. Hutson, of St. Lawrence, N. C. This invention covers a special construction of a plow with removable hopper and means for dropping and covering the seeds, the space between the hills of seed to be regulated by driving wheels of different sizes, and the height of the plow beam to be regulated by an adjustable bolt.

MISCELLANEOUS INVENTIONS.

A folding table has been patented by Mr. William W. Quigley, of Santa Ana, Cal. The invention consists in a skirt board with a recess in one edge, with supports at that edge only, for receiving and supporting a skirt while the same is being sewed, so that all parts can be easily reached by the seamstress.

An improved pump has been patented by Mr. Luis G. Careaga y Saenz, of Puebla, Mexico. It is simple and easy of construction, not apt to get out of order, will raise large quantities of water with but little loss of power, and is not likely to be clogged by sand or other analogous impurities.

A process of removing oleine from linseed oil has been patented by Mr. Thomas H. Gray, of Brooklyn, N. Y. It consists in maintaining the oil at a temperature of 110° F., and in a state of agitation for a certain time, then mixing therewith a saline solution, drawing off, and washing the purified oil with water.

An artificial leg has been patented by Mr. Edgar D. Richmond, of Hart, Mich. The invention consists in improvements in the construction of the knee, ankle, and toe joints, with special arrangement for the suspension strap, the extension spring, and the thigh and lower sections of an artificial leg for thigh amputations.

An electric alarm for spring clocks has been patented by Mr. Edward Jungerman, of Gettysburg, Penn. An electric circuit is applied to a special form of clock, with contact points, to be closed by the expansion of the mainspring, whereby an audible signal may be given on a bell, or one made at a point remote from the clock.

Smoothing the inner surface of wooden tubing forms the subject of a patent issued to Mr. Merrill F. Wilcox, of Bay City, Mich. The method consists in forcing through said tubes a rapidly rotating smooth steel plug, slightly larger than the bore, and distributing resin or like substance for glazing the inner surface in advance of the rotating smoother.

An improved bee hive has been patented by Mr. Joshua Vanzandt, of Seward, Kendall County, Ill. The body has comb frames and a high cover, with a honey board having cleats or flanges upon the edges of its lower side, and with gauze-covered openings, so the board is kept out of contact with the comb frames, and the moist air is allowed to escape freely.

A sidewalk curb and surface case for electric wires has been patented by Mr. Richard Wylie, of Napa, Cal. The invention consists in a case made of grooved castings or blocks along curbs and across the streets at the crossings, with easily removable covers, and with corner pieces, all specially adapted for the easy laying, repair, and adjustment of wires.

A process for coloring and bronzing leather has been patented by Mr. Lorenz Klopfer, of Munich, Germany. The leather is wrapped in a cloth moistened with water and milk, washed with a mixture of white of egg, glycerine, and water, covered with a varnish and then a flexible collodion compound, followed by a coating of size or similar mixture, to which the metal coating is applied before the mixture has become dry.

A hat pouncing machine and lathe has been patented by Messrs. Willet Thompson and Joseph A. George, of Brooklyn, N. Y. The pouncing machine has a special form of counter balance, to prevent swaging or lurching movement, so the machine can be run at a high speed, and there are means for shifting the position of the still point, to adapt the machine for turning hat blocks and other irregular forms.

A wire fence stretcher and splicer has been patented by Mr. Jonathan E. Pierce, of Deming's Bridge, Texas. In the ends of an open box is journaled a screw, one end of which is prolonged, and has a vertical bevel pinion, a rotary motion being imparted to the screw by pinions, while springs force together the ends of levers to grasp an end of broken fence wire.

A combined cane and cigar case has been patented by Mr. David Lee, Jr., of Mount Willing, Ala. The cane is hollow, and the cigars are so placed therein, one above another, that a spiral spring in the bottom will force each one successively to the top, a removable tube adapting the space to sizes of different thickness, and a match receptacle being provided for in the handle.

A mill feeding device has been patented by Mr. James B. Allfree, of Cumberland, Md. The invention covers a shoe with a trough, to oscillate laterally to the path of the grain, the bottom of the trough being lower than its delivery edge, the shoe having a steep incline therefrom and a gate acting therewith, in order to spread the grain and deliver it in an even sheet the whole width of the delivery.

A riding saddle has been patented by Mr. William Frazier, of West Alexander, Penn. It is made of India rubber or its compounds, and is cheap, durable, and elastic, having no tree to break or sewing to rip, and is not liable to be injured by exposure to rain. The body of the saddle is made in one piece in a mould, and the whole may be shaped to prevent contact with the spine and withers.

A revolving map stand has been patented by Mr. Henry E. Hayes, of Brooklyn, N. Y. The base block has screw rod and nuts and a triangular socket; a revolving top block has sockets, supporting rods fitting into the sockets, a wedge block for securing the lower supporting rods in place, and a suspension rod for the upper supporting rods, all to promote convenience in exhibiting maps, charts, etc.

A spring board wagon has been patented by Mr. John C. F. Harris, of Littleton, N. H. A foot board is mounted on the spring board by springs more yielding and having longer range of movement than the spring board itself, to protect the feet of the rider from the benumbing jar of the spring board, and there is a novel arrangement of springs with the seat to render its motion easier.

An improved inserted tooth fastening for ice plows has been patented by Mr. John G. Rodenstein, of Staatsburg, N. Y. The invention consists in a fastening with a stop plate having a specially shaped head at its upper end and a shoulder at its lower end, with a wedge key having a screw and a nut on its upper end to adapt it to be inserted between the parts of a plow beam, to clamp an inserted tooth against the edge of a plow plate section.

A safety stop for elevators has been patented by Mr. Ellison Saunders, of Austin, Texas. A lever is pivoted to the bottom of the car, with a spring for throwing it into position transversely to the car bottom, so that the ends of the lever can catch on horizontal bars on the sides of the elevator shafts, a rope on one end of the lever to the car cable keeping the spring taut and preventing it from throwing the lever unless the elevating cable brakes.

An apparatus for manufacturing illuminating gas has been patented by Mr. James J. Shedlock, of Barnet, Eng.; with the retorts for first distilling the tar, the condensing devices and tar receptacle, is a vertical retort, having a feed pipe at its upper end connected with the tar receptacle, and an outlet pipe for gas leading to the mains, the retort being adapted to be filled with coke, and connected with a superheated steam coil, so all the volatile hydrocarbons will be converted into permanent gases.

An improved railway gate has been patented by Mr. Lawrence C. Walsh, of Webster, Mass. The object of the invention is to provide a simple and trustworthy means for closing railroad crossings on the approach of trains, for which purpose a suitably sized gate is so hung by pulleys from a bar above that the gate may be rolled to one side and back again by wires or levers properly connected with a station, or by mechanism in position to be operated by passing trains.

NEW BOOKS AND PUBLICATIONS.

NEW YORK STATE SURVEY. Report for the year 1883. By the Board of Commissioners and James T. Gardiner, Director.

In 1876 the first accurate trigonometrical survey of the State of New York was commenced, a work which has since been prosecuted in a manner which reflects credit upon the Board of Commissioners and upon the able director in charge and his assistants. During 1883, beyond the general work of the survey, considerable attention was given to the hydrography and drainage of Niagara, Erie, Genesee, and Orleans Counties, at the request of the State Board of Health, the results reached in which have, also, an important bearing on questions relating to the maintenance of water supply in streams. These reports have been growing more valuable each year, but now have an added interest, as people are more earnestly looking into the matter of forest preservation, average rainfall, and the maintenance of the larger streams and navigable channels of the State.

SHAVINGS AND SAWDUST; A BOOK ON WOODWORKING MACHINERY. By John Kane, "Observer." C. A. Wenborne, Buffalo, N. Y. Price, $1.50.

This book, consisting largely of articles formerly published in the *Lumber World*, is the work of a practical man, and speaks as with the authority of an experienced workmen on the designing, construction, care, and operation of machinery used in planing mills, sash, blind, and cabinet factories, car shops, etc. It is well calculated to be of value to purchasers and owners of machinery, and has much of instruction and needed warning for inexperienced or careless operators.

THE GLASS DEALER'S READY RECKONER. A series of tables of superficial measurement, from 1 to 132 in. in width by 2 to 180 in. in length. John Thorpe, New York. Price, $1.50.

Special.

A CLERGYMAN'S REMARKABLE EXPERIENCE.

Evidence of the wonderful results which are following the use of Compound Oxygen accumulates with an almost bewildering rapidity. There seems to be no phase of bodily suffering, and no type of disease, which this subtle agent will not reach. The subjoined communication gives the history of one of a class of cases especially found among clergymen and all professional men and brain workers. The changes wrought in three months, as related by the writer, are truly marvelous. From a state of physical and nervous prostration, which had become alarming, he was restored to such vigorous health that, to use his own language, "I found myself able to preach Sunday morning, teach a Bible class of seventy-five or a hundred after sermon, attend an afternoon service often, and preach to a congregation of a thousand persons in the evening, and say in truth, at the close of my evening service, that I was not conscious of any more weariness than when I began in the morning."

This seems almost incredible, but Dr. Cushing, pastor of the First M. E. Church, Rochester, N. Y., is a clergyman of wide repute, and no one who knows him will for a moment question his statement. It is given herewith in his own words:

16 N. Fitzhugh St., Rochester, N. Y., January 11, 1884.

DRS. STARKEY & PALEN:

Dear Sirs: It is nearly four years since I first used Compound Oxygen. I have often spoken of its effects to others, but have never, I think, made any statement to you. There are others, doubtless, who would be glad to know of its effects in a case like mine. I was not sick, though my strength had been greatly impaired by sickness in earlier life. But for fifteen years I had been carrying very heavy burdens and doing very hard work. I found myself gradually losing the power of endurance, so that my work left me too much exhausted. I could see that my whole nervous system was giving way; that there was a manifest lack of vital force. This was most apparent and most alarming when I went to my study. There I discovered a lack of the usual quickness of perception—a lack of power to hold on. My mind was losing its grip. At the point where I needed most strength, I found it suddenly failing me. This alarmed me, though I am not aware that my friends had discovered it. Connected with this case was a lack of that physical vigor necessary for good digestion, and a consequent lack of nutrition. Sleep was fitful, insufficient, and unrefreshing. Under these circumstances I began the use of Compound Oxygen. At first I saw no results. After a time I observed my digestion was much improved. More restful sleep followed. At the end of three months I found myself able to preach Sunday morning, teach a Bible class of seventy-five or a hundred after sermon, attend an afternoon service often, and preach to a congregation of a thousand persons in the evening, and say in truth, at the close of my evening service, that I was not conscious of any more weariness than when I began in the morning. My sleep was as refreshing on Sunday night as on any other night of the week. My mind has never worked better than during these four years, and in no other time of my life could I do as much work, or do it with as much ease.

I do not use the Oxygen now unless I find myself getting a little weary. Then a resort to it for two or three weeks puts me in normal condition again.

This is my experience, and I have much reason to be grateful for it. Sincerely,

CHAS. W. CUSHING, D.D.

Many other eminent clergymen bear testimony to the efficacy of Compound Oxygen as a curative agent. It is also unequivocally indorsed by such leading public men as Hon. W. D. Kelley, Member of Congress from Penna.; Judge Flanders, of New York City, for many years law partner of Vice-President Wheeler; T. S. Arthur, the veteran author and temperance writer; and Wm. Penn Nixon, publisher of the Chicago *Inter-Ocean*.

Drs. Starkey & Palen, 1109 and 1111 Girard St., Philadelphia, are the sole dispensers of this remarkable curative agent, and will send, without charge, their Treatise on Compound Oxygen, giving all desired information in regard to it, to any one who will write to them.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

All Books on Electricity, cheap. School Electricity, N.Y.

SCIENTIFIC AMERICAN, complete since 1860, each volume stitched in paper cover at 75 cents. W. G. Starke, Zanesville, Ohio.

Wanted.—Patented articles or machinery to make and introduce. Gaynor & Fitzgerald, Lexington, Ky.

Many of the most prominent engineers testify to the superiority of the Selden Patent "Rubber Core" Packing for steam and hydraulic use. It is manufactured by Randolph Brandt, 38 Cortlandt Street, New York.

Patent for sale.—$1,000 cash will buy the U. S. patent for "Perfect" Potato Parer. Patented February 27, 1883. Best in the market. Send $1.00 for sample. J. A. Moffat, 118 Bay Street, N. Hamilton, Ontario, Canada.

Sewing machine, water closet, & other light castings made to order. Lehigh Stove & Mfg. Co., Lehighton, Pa.

"How to Keep Boilers Clean." Book sent *free* by James F. Hotchkiss, 86 John St., New York.

Stationary, Marine, Portable, and Locomotive Boilers a specialty. Lake Erie Boiler Works, Buffalo, N. Y.

Railway and Machine Shop Equipment.
Send for Monthly Machinery List
to the George Place Machinery Company,
121 Chambers and 103 Reade Streets, New York.

The Hyatt filters and methods guaranteed to render all kinds of turbid water pure and sparkling, at economical cost. The Newark Filtering Co., Newark, N. J.

If you want the best cushioned Helve Hammer in the world, send to Bradley & Company, Syracuse, N. Y.

Iron and Steel Drop Forgings of every description.
R. A. Belden & Co., Danbury, Ct.

"The Sweetland Chuck." See ad. p. 188.

Hoisting Engines for Mines, Quarries, Bridge Builders, Railroad Construction, etc. Send for catalogue.
Copeland & Bacon, New York.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Pumps—Hand & Power, Boiler Pumps. The Goulds Mfg. Co., Seneca Falls, N. Y., & 15 Park Place, New York.

For Freight and Passenger Elevators send to L. S. Graves & Son, Rochester, N. Y.

Best Squaring Shears, Tinners', and Canners' Tools at Niagara Stamping and Tool Company, Buffalo, N. Y.

Lathes 14 in. swing, with and without back gears and screw. J. Birkenhead, Mansfield, Mass.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent Agency, 261 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Improved Skinner Portable Engines. Erie, Pa.

Straight Line Engine Co., Syracuse, N. Y. Best in design, materials, workmanship, governing; no packing.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Catalogues free.—Scientific Books, 100 pages; Electrical Books, 14 pages. E. & F. N. Spon, 35 Murray St., N. Y.

American Fruit Drier. Free Pamphlet. See ad., p. 221.

Curtis Pressure Regulator and Steam Trap. See p. 222.

Brass & Copper in sheets, wire & blanks. See ad. p. 222.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Friction Clutch Pulleys. D. Frisbie & Co., Phila.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 222.

Cutters for Teeth of Gear Wheels formed entirely by machinery. The Pratt & Whitney Co. Hartford, Conn.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 222.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 221.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) W. A. E. asks: How is the gelatine made which the plaster of Paris workers use for their moulds? Can I find a book on this kind of casting? A. The gelatine used for moulds is made by soaking good white or light colored glue with a little water until it is thoroughly swelled; have no excess of water. Then add four times its weight of glycerine. Melt and stir, keeping up the heat for an hour to boil off the water that was in the glue. If too hard, add glycerine; if too soft, add soaked glue, reheating each time until you get the exact consistence for moulding; pour your moulds hot; grease the matrix.

(2) C. S. F. asks: Which is the better way to set a small circular rip saw (14 in.)—so that it will just reach through the stuff, or lower the table that it will move perpendicularly? Which method requires the most power? A. A saw cuts easier across the grain. Cutting at the top of the saw is lengthwise of the grain of the wood, and cuts harder and of course takes more power. Saws cut easier or with less power with the top of the table as near the center as possible, or so that the flange that holds the saw just clears the stuff to be sawed. This is the practice with the makers of frames. Sometimes the tables are made to raise for some special purpose—not for the saving of power.

(3) J. B. W. asks for a formula for the velocity of steam in steam pipes under different heads. A rule that can be used to find the area of steam pipe is what I desire. A. You will find the formula for flow or velocity under different pressures, also table of velocities, in Clark's "Manual for Engineers," pages 890, 895, etc.; they are too large to extract and send in a written communication. For ordinary air pressure engine steam pipes of area one-twelfth to one-fifteenth the area of cylinder will do well; the greater the speed of the engine, the larger the pipes.

© 1884 SCIENTIFIC AMERICAN, INC

(4) H. W. S. says: I have long noticed in church or other public assemblies, the women almost universally sit upright in a natural attitude, while men almost universally take a lounging position, leaning on one hand, or with back much humped, or with one leg over the other, or in some other unnatural position Can there be any reason for the difference except foolishly contracted habit? A. The ungraceful attitude of the men is doubtless owing to careless habits. The erect and finely developed physique of the ancient Egyptian women was said to be due to the habit of carrying water pitchers on their heads; bonnets and hair suffice for modern ladies.

(5) W. M. P. writes: 1. We are about to put in three 5 ft. by 16 ft. boilers, forty-four 4 in. tubes. I contend that it is not safe to carry the fire over the shell of the boiler to the stack or chimney; others contend it is safe, and some boiler makers claim it is the proper way to set a boiler. A. Returning the flue over the top of the boiler is much practiced for economy, and is perfectly safe. The arches must bear upon the side walls and be thoroughly stayed, because the arch has a tendency to push the walls apart, which is the only objection. 2. What size flue do we want to build in the chimney for 3 boilers 5 ft. by 16 ft., 44 4 in. tubes, furnace 5 ft. square, to each boiler? Also would you build the flue larger at top than at bottom to burn shavings and wood? A. Build the flue 4 ft. square (16 square feet area) for shavings. The universal way is to build straight inside and taper outside. Do not know that there is any gain in widening toward the top if a straight flue is large enough.

(6) C. S. writes: I want to use a rope and pulley, and at a certain point on the rope there is a clutch or grip brought against the same to hold the rope and its load, but the grip wears the rope in a short time. Is there no substance that could be put on the rope to prevent the wear? A. A rubber varnish upon the rope would give it more stickiness, but the kind of grip that you describe will tear anything that you may put on the rope. Instead of the short hold of your grip on one side of the rope, make a groove in two straight pieces of lignum vitæ and fasten one piece near the pulley so as to bear on the straight part of the rope. Fasten the other piece to a lever opposite to the first piece, so that you can grip a long surface of the rope at once; then you will not have to press so hard.

(7) J. S. K. asks: How is the cost of grading the bed of a railroad through an unbroken country easiest and best determined? The land is of a sandy soil, and quite level, with an occasional small swamp to cross. A. If you can run your road so that the cuts and fills will be equal to each other, the subject is very much simplified. The cost of excavating is computed at so much the cubic yard, the prices being affected by the quantity and quality of the material and the disposition of it. If there is not excavated material enough, the cost of filling is ascertained by the same method. If the swamp cannot be readily filled, you can compute the cost of pilling at so much the pile or running foot. The cost of ballast, ties, and rails can be obtained upon any given length of road.

(8) G. F. L. asks: 1. What load will a flat boat 15 ft. wide and 40 ft. long, carry? A. If the scow outline is a parallelogram with vertical sides and ends, it will carry one ton to each one inch additional draught of water in *fresh* water. 2. If boat empty sinks in water 3 in., how much load will it take to sink it down to 4 in., then inch by inch to 12 in. deep? A. If boat of same dimensions, 4 tons will sink it 4 in., and 1 ton for each additional inch.

(9) W. S. asks how to read the indicator or registering dials of an ordinary gas meter, and also describe the cold water annealing process? A. For reading your meter dial commence at the right hand dial; it is marked 1 thousand, which means for the whole circuit each division is one hundred cubic feet. The second dial hand turns to the left on account of the construction of the gearing upon the inside for simplicity; this dial is marked 10 thousand, each division reading one thousand. The third dial hand again turns to the right, and is marked 100 thousand, which also is the sum of the whole circuit, each division reading 10 thousand. Always enter the *figure following the hand* (not before) in the way the hand is turning. Enter each figure, and place 00 at the right. The small dial marked cubic feet is not used except for testing. Water annealing of steel is simply heating the piece to a full red heat; lay it in some dry ashes or lime until it ceases to be red, or what is called a black heat, then plunge in warm water—80° to 100°. This makes steel soft for die cutting.

(10) E. C. O. writes: 1. I have an iron cylinder 50 in. internal diameter, 3 ft. long, and ⅜ in. thick. This cylinder is placed inside of a somewhat larger cylinder whose internal diameter is 51¾ in., leaving a space between the concentric cylinders of ½ in. This space is tightly filled with water under pressure of 1 atmosphere. The ends of the cylinders are closed with heavy iron plates capable of withstanding almost any pressure. Now, how much external pressure per square inch will this double cylinder stand, supposing it were placed inside of a large iron box and water pumped into the iron box by hydraulic pressure? A. Under the conditions you name, if your cylinders are of the same thickness and quality, you will get, theoretically, the combined strength of the two. The intervening water jacket permits of this. But if you make the cylinders with flat heads, the question of distortion comes in, the problem becomes much more complicated, and the power of resistance of your cylinders will be greatly reduced. The two cylinders, if made of good quality of wrought iron and with heads of proper form and strength, should sustain practically an exterior pressure of 200 pounds per square inch. 2. A log 16 ft. long and 4½ ft. in diameter with the ends somewhat pointed is floating in a lake with about an inch of its upper surface projecting above the water. The log weighs 8,000 pounds. How much forward traction will it require to pull the log slowly? A. This cannot be answered, as no form of ends, condition of surface, or velocity is given: you will find the results of experiments in towing logs in Beaufoy's "Nautical Experiments."

(11) J. M. H. asks: What will whiten the ivory keys of an old organ that have turned yellow by standing in a church? A. Bleach them by treatment with hydrogen peroxide; see SCIENTIFIC AMERICAN SUPPLEMENT, No. 339.

(12) R. H. M. writes: A. has a circular farm containing 80,000 square rods. What will be the diameter of three small circles inside of large circle, so they will just touch each other? A. For the solution of your problem—rule for finding the diameter: divide the area by 0·7854, and the square root of the quotient will give the diameter of the circle. Thus:

$$\frac{80{,}000}{0{\cdot}7854} \text{ sq. rods} = 101{,}858{\cdot}9. \qquad \sqrt{101{,}858{\cdot}9} = 319{\cdot}1 \text{ rods}$$

diameter. Its half diameter is 159·55 rods. The center of the great circle is the apex of the two sides of a hexagon around the proposed small circles. The ratio of the sides of hexagon to the radius of its inscribed circle is 1·156 to 1, which by adding equals 2·156 = the semi-diameter of the great circle in semi-diameters of the lesser circles. Then from above

$$\frac{159{\cdot}55}{2{\cdot}156} = 74 \text{ rods} = \text{semi-diameter of lesser circles, 148 rods}$$

being their diameter.

(13) F. J. M. asks: Is there in successful operation any motive power (other than the steam engine) for propelling small boats and launches? A. We know of none, but many experiments have been made with electricity, some of which are claimed to be successful. None, however, are in more than the experimental stage.

(14) W. R. H. asks: 1. What is the cause of pipes bursting in cold weather? Is it that water expands when freezing? A. Water expands when freezing, the ice occupying a larger space than the water that produced it; but as the process of freezing is a gradual one, the water in a pipe partially frees itself from constraint, and the pipe may become filled with solid ice and not burst until the temperature has fallen so low that the contraction of the iron over the rigid ice produces rupture in the iron. Pipes are also burst by freezing solid at different points. The falling temperature of the intermediate water-filled space will cause an expansion of the water between the point of greatest density, 40°, and the freezing point sufficient to produce the requisite pressure for rupture. 2. And what is meant by 40 pounds pressure in cylinder when boiler is under 60 pounds pressure? Is that obtained by throttling steam? I have a 2½ in. Judson governor: it works as well as possible up to 80 pounds, but above that amount of steam it competely fails to regulate speed of engine. In supply pipe, above governor, I have attached a Baker's automatic lubricator, and use pure lard oil, but got no better result. A. The 40 pound pressure may be the mean pressure caused by cutting off by the set of the slide valves, or may possibly mean the initial pressure caused by throttling. Governor valves, when speeded for a certain number of revolutions of the engine within certain limits of pressure, require readjustment for change of speed by change of the size of the speed pulley, and for change in the boiler pressure by adjustment of the cut-off position of the governor valve. For a given amount of work a governor valve set for an average of 60 pounds pressure with a variation of 10 pounds will not operate satisfactorily with 80 or 90 pounds pressure without readjusting the valve.

(15) C. W. V. writes: There is in this city a coal run which rises 5 ft. in 100, or the rise is one-twentieth of the length. Now, a locomotive standing on this incline can just hold her own with her brakes set on her drivers, that is, the friction between the drivers and track will keep her from sliding down hill. The locomotive weighs say 100 tons with tender. The same locomotive will draw on a level 40 cars weighing 1,200 tons. I reason as follows—the locomotive holds one-twentieth of its weight, equals 5 tons, that is, on a level it would pull 5 tons. This 5 tons dead pull pulls 1,200 tons on wheels, that is, 1 ton pulls 250; the coefficient of friction is therefore one two hundred and fiftieth, equals two-fifths of 1 per cent for freight cars. Is this right? A. It is found that, with an exceptionally good track, and cars in good condition, after motion is started 6 pounds per ton (2,000 pounds) will keep up a slow movement—but 8 pounds per ton is usually allowed. The resistance increases with the speed—at 20 miles per hour to about 11 pounds per ton, and at 30 miles per hour about 14½ pounds per ton. Eight pounds per ton on 1,200 tons equals 9,600 pounds, not quite 5 tons.

(16) J. A. T. says: In the inspection and repair of freight cars built of the best material and manufactured in first class shops, one of the defects frequently discovered is loose wheels. The wheels are sometimes found to be loose on comparatively new cars, that have never been wrecked in any manner whatever. These wheels are bored to a certain size, the axle turned to what machinists term "the wheel fit," and left enough larger to require a pressure of from 25 to 30 tons to force the axle into the wheel. Now, in the absence of an accident of any kind to the car, what can be assigned as the cause of these wheels getting loose? Would the bore of the wheel, next to a journal that for some distance had been running hot and heating the wheel, be after cooling again the same size as when originally bored out? A. Loose wheels in 99 out of 100 cases are due to bad fitting; generally in such cases the axle fit is straight, and through wear of boring tool of car wheel boring machine the wheel fit is slightly taper, and the wheel works loose. With *straight* fit in both axle and wheel, and an allowance in size requiring 30 tons to press on, no trouble is experienced. If the bearing runs hot and is suddenly cooled with water, the tendency would be to loosen the wheel, owing to the shrinkage of axle due to sudden cooling, etc. Excessive clearance between flange of wheel and rail, especially on sharp curves, if the car is heavily loaded, tends, owing to the sudden blow on the flange, to drive the wheel in and loosen it. Difference in hardness of iron of wheels changes pressure required to press wheel on, sometimes as much as 10 tons, and loose wheels sometimes result from this. The chilled tread puts a strain on the wheel like a tire, and when this is worn away the strain is lessened, allowing wheels to slip on axle if an aggravating cause occurs, such as sharp curves. Loose wheels sometimes are occasioned from using too pointed a tool with too coarse feed, the fit presenting a surface of being threaded. When the wheel is pressed on, it may go on with the required pressure, but the broken ridges left by tool jar out and allow wheel to slip.

(17) S. P. writes: 1. Can I make the telephone, Fig. 4, SUP. 421, for my own use and experimental purpose, but not to sell? A. You can make it for experiment, but not for use or sale. 2. What is the best kind of glue for sticking carbon to wood and ferrotype, etc.? A. Use gutta-percha and pitch equal parts melted together. 3. What would be about the power of the dynamo in SUP. 161, enlarged five times? A. If you propose to make a large dynamo, it would be best to make it after Siemens' recent pattern.

(18) C. N. S. asks the best plan to moisten the atmosphere of a closet or chest by cold water alone? A. By rearranging the shelves you might get room enough next to the top above the shelf to slide in a shallow tray of water, with partitions standing about 2 in. above the water, with cotton or linen cloth folded over them so as to dip into the water, which will greatly increase the surface for evaporation. The shelves should be of slats, or with an open space at the back and front for circulation of the moist air.

(19) C. W. H. asks: What will caseharden malleable iron, and directions for use? I have tried prussiate of potash, and it does not harden the surface. A. Make a powder of common salt 8 parts by weight, prussiate of potash 7 parts, and bichromate of potash 1 part. Heat the iron red hot, cover it with the powder, melt it on, and chill in a water bath while the iron is hot.

(20) I. L. H. writes: My engine has a 20 ft. by 10 in. stack, twenty-three 2 in. flues; size of fire box, length 30 in., width 18 in., depth 27 in.; length of flues, 60 in., but does not steam as it should; will you please tell me what is wrong? Also what horse power would I get from this engine with 60 pounds steam, cylinder 5½ x 8, running 225 revolutions? A. Your description of the boiler is not sufficient for exact estimate of its power. We estimate it as an 8 horse boiler. The engine at the pressure and speed you mention is estimated at 10 horse power. Your boiler is not large enough by 50 per cent for the engine rate.

(21) J. L. C.—Steel upon steel has less friction than steel upon yellow brass. Steel upon a composition of copper and tin, such as hard journal boxes are made of, has the least friction. A slide having a flat bearing has less friction than with a round bearing.

(22) G. H. M. asks: Does a vessel passing over the span of an aqueduct increase the weight sustained by such span, and reasons, *pro* or *con*.? A. Yes. Theoretically, by the amount that the water is raised by displacement. Of course this is not appreciable in a large expanse of water, but in a confined reservoir the weight would be considerable. This calls to mind the anecdote of how King James puzzled the philosophers in regard to weight of the fishes and the bowl of water.

(23) J. H. Z. asks: 1. Can you give me through the columns of your paper the composition and the process of making the alloy used for hard soldering brass, copper, etc.? A. A hard solder may be made of brass 1, zinc or tin 1; a soft solder: tin 2, antimony 1; or of brass 6, zinc 1, tin 1—these by weight. Melt the brass in a crucible, add the softer metals, and when solidified but not cold, beat the mass in an iron mortar to a granular consistency. 2. Also process of making gold solution to plate without battery, that is, to give gold color by rubbing solution on article to be plated? A. Dissolve gold leaf in quicksilver and apply with a woolen cloth. This method of gilding is evanescent and almost valueless. 3. Are muriatic and hydrochloric acid the same? A. Yes. 4. Is not borate of soda common borax? A. Borax is produced from the borate of soda.

(24) E. E. H. asks: 1. What is the best method of varnishing slate table tops which have been ornamented by painting on them a design in oil colors? What varnish is used, and how applied? If with a brush, how can the strokes of the brush be prevented from showing? If dipped, give particulars? A. Use a soft camel's hair brush and cover the table with a coat of heavy body varnish, such as can be purchased of any paint house. 2. A receipt for ebonizing liquid. I have used nut galls and acetate of iron, formerly with good results, but lately the iron acetate will not produce the black. A. The majority of the receipts given include acetate of iron in some form or other. The following is one entirely free from iron salts, and may be found desirable: First sponge the wood with a solution chlorhydrate of aniline in water, to which a little copper chloride has been added. When dry, repeat with a solution of potassium bichromate. Do this two or three times.

(25) J. H. K. asks for a stain for violins of a dark chestnut or seal brown color? A. The following will give a boxwood brown stain: Hold your work near the fire, so that it may receive a gentle warming; then take aquafortis, and with a feather pass it over the work till you find it change to a fine brown (always keeping it near the fire); you may then varnish or polish it.

(26) P. K. W. asks: 1. What can I put into calcimine that will harden it so it will bear washing? A. The addition of a small quantity of potassium bichromate to the calcimine will probably render it sufficiently insoluble for your purpose. 2. What can I put into a wash made of sizing and Venetian red, that will harden it sufficient for outside work on brick walls? A. There is nothing we can recommend to you other than the use of a better quality of paint. If it were possible to accomplish the end you suggest, we think that such an article would entirely supplant the use of paint, and therefore would be directly procurable from the paint houses.

(27) A. S. C. asks: Is there any paint or any material with which I can paint an inside plastered wall to keep out moisture or dampness? The plastering is done on rock, and I think the moisture is mostly from perspiration. I wish to paper the wall. A. You might coat it with silicate of potash or soda, which would result in a very hard surface, or two or three good coats of zinc ground in linseed oil would do. But we think your best plan would be to have a wall within a wall, one of which would receive the perspiration and permit it to drip and run off, and the other could take the paper hanging.

(28) W. F. T. writes: Have steam yacht; length of keel, 45½ ft.; length over all, 56 ft.; beam, 10 ft.; draught of water, 4 ft.; engine, 25 horse power; diameter of cylinder, 9⅜ in.; length of stroke, 9½ in. We are using 43 in. 3 bladed screw. 1. Would we gain in speed by using 4 bladed screw? A. We think not. 2. If so, what size would you recommend? A. Your propeller would do better if 3 or 4 in. larger in diameter. If you have ample boiler, you may get increased speed by making a propeller 3 or 4 in. larger and of *less pitch* than the present one.

(29) S. B. D. asks: What size wheel he should use for a yacht 35 ft. long, 6 ft. wide, 3 ft. deep? When not loaded draws 18 in. at the bow and 28 in. at the stern. Engine, 4 x 6; boiler of steel, 27 x 46; fifty 1½ in. flues; pitch of shaft, 1 in. to the foot. A. Two feet 8 in. diameter and 3 ft. 4 in. to 3 ft. 6 in. pitch; we doubt if you have boiler enough for good speed.

(30) J. M. La B. asks: 1. Which is the best way to put a patch on a boiler—to rivet, or with patch bolts? A. Riveting it on. 2. What lap should the sheets of a boiler have, size of boiler 17 ft. long, 66 in. diameter, iron ⅜ in. thick, and seventy-two 4 in. flues, and at what pressure would they be safe with only ⅞ in. lap? A. If single riveted, and using ¾ in. rivets, the lap should not be less than 2⅜ in.; if double riveted, 3¾ in. We cannot understand what you mean by ⅞ in. lap; ¾ in. rivet is the smallest that should be used in ⅜ in. plate; you would then have but ⅛ in. outside the rivet. If you mean ⅞ in. outside rivet hole, then by Government rule you could carry safely, if single riveted, 85 to 95 pounds per square inch according to the quality of the iron.

(31) J. J. A. asks: 1. How to find the shape of a plank or planks of a boat about 20 ft. long, so that it will assume the shape of the ordinary planking. I have the drawings of the boat I would like to make, and perhaps you could inform me how to proceed therefrom? A. The width at the several sections is taken from the mould loft floor and set off on the plank, and a batten set to strike through the points set off. 2. Also how to find the pitch of propeller, size of engine and boiler for a given boat? A. There is no general rule which will apply; size of vessel, the model, and draught of water all affect the question.

(32) F. F. asks: Can air be forced through a pipe a mile long by a pump, and if so, would it make a slight pressure? A. Yes; the pressure would depend upon the power applied to the pump.

(33) J. H. M. asks: How are nickel plated articles treated previous to being plated with silver? A. The articles are first dipped in caustic potash and so thoroughly cleansed, then dipped for a moment in nitric acid followed by a dip in water, after which the article is put into the silver bath.

(34) W. S. C. asks: In a steam engine, which gives the most power—lap or lead of the valve? A. Lap increases economy by working the steam to a limited extent. Lead does not increase the power, except in cases where passages are so small that the initial pressure cannot be maintained, when it does so to a slight degree.

(35) S. S. C. asks for a receipt to make common newspaper water tight and tough? A. Strong unsized paper is immersed for a few seconds in sulphuric acid diluted with half its volume of water. It is then washed in pure water or in a weak ammonium hydroxide solution. The acid liquid must be of the same temperature as the surrounding atmosphere. 2. Also a mucilage that does not soften by being exposed to the water? A. The addition of 2 per cent of potassium bichromate to the water in which glue is dissolved, just prior to its use, and exposing the glued article to light, will make it insoluble even in hot water. See also "Cements," SCIENTIFIC AMERICAN SUPPLEMENT, 158.

(36) E. L. B. writes: 1. I have a lot of shop worn nickel plated yellow brass harness trimmings. Can you tell how to mix a solution that will remove the nickel and not injure the surface of the brass? Can it be done without employing electricity? A. The only way that the nickel can be recovered is by buffing it off There is no other satisfactory method. Any solution that will dissolve nickel will likewise dissolve the other metals. 2. Would also like receipt for making yellow brass and red or bronze metal. I have experimented some in this direction, but cannot get the metal to run good and fetch the work? A. Yellow brass for turning: copper, 20 lb.; zinc, 10 lb.; lead, from 1 to 5 oz. Put in the lead last before pouring off. Red brass, free, for turning: copper, 160 lb.; zinc, 50 lb.; lead, 10 lb.; antimony, 44 oz.

(37) C. H. writes: 1. I am a fisherman, and in the course of a year catch a good many dog fish, gars, turtles, and other unsalable fish, amounting to several tons. How can I cheaply reduce them to fertilizers, so that they may be kept till wanted for use? A. Let the fish rot in open tanks or covered underground. After they have partially rotted, add sufficient dilute sulphuric acid to cover them, then neutralize by adding lime. Work the mass up and dry it. 2. What is the best preparation to use on fish nets, such as are set in the water to remain for a time? Am now using coal tar. Do you think pine tar better? A. Either coal or wood tar can be used; perhaps linseed oil would be better. 3. I would like to know how to reduce old bones to fertilizers, so that they will keep till wanted? A. Bones may be treated by filling an old barrel with alternate layers of wood ashes and fresh bones, slightly wetting from time to time with hot water. 4. What is a good bait to draw eels? A. Try tripe.

(38) D. W. E. asks: 1. How to temper open coiled springs, so that the coils do not close in heating and hardening. What is put between the coils when being heated? A. Nothing. 2. In winding a spring, after hardening and tempering, it broke; was the cause coiling it cold, getting it too hot, or hardening it too much? A. The spring should be heated evenly over a charcoal fire or in a muffle (oven) to a clear red, chilled in animal oil, and tempered by blazing over a charcoal fire. 3. What is the difference between a char-

© 1884 SCIENTIFIC AMERICAN, INC

coal and a coke fire for heating for tempering? A. Charcoal is preferable, as all coke contains more or less of sulphur, which is injurious to the integrity of the steel.

(39) J. S. C. asks: 1. Can molten brass be successfully run into iron moulds? If not, can you say the reason? A. The composition of brass—partly zinc, a volatile metal—precludes its successful casting in a cast iron mould, there being no adequate escape for the heated gases. 2. If that is impossible, is there any mixture which would do so, and take a silver plate by deposit or wash? A. Use a composition of which tin is the basis, and it will pour readily and plate easily.

(40) J. G. W. asks if there is an English translation of "Brehm's Animal Life"? A. "Brehm's Animal Life" is not yet translated into English.

(41) G. L. F. asks how to prevent his melted tin moulds from sticking to his sheet tin patterns when poured, the blacking of the pattern over a lamp proving futile? A. Use a blacking made of ordinary lampblack mixed with lard or sperm oil, and dust with powdered plumbago through a muslin bag.

(42) S. F. F. asks: Can malleable metals be compressed by pressure or hammering to one-half thickness, the edges being confined; or can the weight of metals be increased by pressure or condensing of the metal? A. No. All metals are subject to condensation by pressure, but none to the amount of one-half their bulk. No increase of weight is given to metals by condensation—the blank coin weighs the same as the finished coin. The only use of pressure of metals is making a better surface for finishing.

(43) A. C. G. says: 1. He has difficulty in procuring a fancy casting in an iron mould, using lead, solder, and a mixture of both, and heating the mould. The metals do not run. He asks what composition will do? A. Neither lead, nor lead and antimony—solder—will make a metal fluid enough for the purpose if the casting is thin. Use pure Banca tin, or tin 8, zinc 2, or a composition having tin for a base and no antimony. 2. He asks also how to make his ink black at the time of writing, or to become so afterward? A. We recommend you to examine article on inks in SCIENTIFIC AMERICAN SUPPLEMENT, 157.

(44) D. and T. ask: Can you inform us how light hardware, such as hat and coat hooks, curtain fixtures, etc., are bronzed? A. Dull bronze is given by a coating of bronze powder in white (bleached) shellac varnish—shellac dissolved in alcohol. A brilliant bronze is given by a coating of furniture polish left until "tacky," and then the bronze powder applied with chamois leather.

(45) S. R. R.—To sand wood: Paint the wood with a thick paint and dust the sand on through a sieve fixed to a small tin box in which the sand is placed.

(46) E. F. H. asks how Seidlitz powders are made? A. The following ingredients are mixed—in a blue paper: 40 grains soda bicarbonate, 120 grains Rochelle salts; and in white paper, 35 grains Rochelle salts.

(47) J. J. G. asks what is best compound to paint row boats with? A. Use zinc paint mixed with raw linseed oil.

(48) W. M. H. asks for a receipt for the liquid used to ebonize wood, and how to apply it? A. One gallon of vinegar, one-half pound of green copperas, one-quarter pound of China blue, two ounces nut galls, two pounds of extract of logwood. Boil over a slow fire, then add a pint of iron rust. Wash the wood with this. 2. Also, the receipt used by instrument makers for staining or lacquering brass that dark green seen on surveying instruments? A. Dissolve shellac in alcohol, strain, and add turmeric or gamboge in sufficient quantity to produce the desired shade.

(49) M. and W. ask how to boil soap water and kerosene, so that it would become a solid mass. What could be put in to make it become hard? Also, would it be dangerous to boil the kerosene? A. It is not possible to produce a solid mass in the way you suggest, for the reason that kerosene does not contain any fatty acid, and hence will not saponify. An emulsion can, however, be produced. Great care is necessary in boiling kerosene to prevent an explosion.

(50) W. S. M. asks: If coal oil, supposed to be 175°, should "flash" at a lower temperature at this altitude (10,200 feet), also the correct way to make the test? A. We do not know that the high altitude test for coal oil is known. We should judge that the "flash" temperature will be higher at the altitude you name. You may easily try it, by placing a thermometer in a small cup of the oil, and gently heating until by repeated trials of a lighted match passed over the cup about an inch above the oil a flash is produced; then note the temperature by the thermometer.

(51) J. B. H. writes: In the shop where I am employed there is an engine, 14 in. bore, 30 in. stroke, making 90 revolutions per minute; the steam pipe is 3½ in. gas pipe. The exhaust leads into a tight steam box, never in open air, about 60 feet away from engine; about one-half of the exhaust pipe is 4 in. gas pipe, balance 6 in. sheet iron pipe. question: is the exhaust sufficient? I have claimed that to take away the 4 in. gas pipe and to put in 6 or 8 in. escape pipe will improve it, inasmuch as the exhaust must be cramped at box. Is this so? A. You are right; if the box into which you exhaust is really tight, back pressure may be produced there, more than by the small exhaust pipe. Is there *any* escape for the exhaust steam from this box?

(52) A. J. asks: What to paint wood with, so that glued paper will not stick to the wood while the glue is drying? A. We would recommend you to coat the painted work with paraffine.

(53) S. L. asks: Which is the best wood for making violin tops? Norway pine and spruce are what we can get here. A. The body of the instrument is made by the best makers of straight grained deal, and the back of maple, sometimes of sycamore, and in very old instruments of pear wood.

(54) W. S. asks: Will one cell be sufficient to operate a small vibrating bell? If so, what kind of cell must it be? A. Use one cell of Leclanche or Fuller battery.

(55) C. F. J.—We cannot furnish you with the formula of soapine unless a chemical analysis were made to determine its ingredients. We are disposed to believe, however, that the essential constituent of the article is either the crude soda ash or pearl ash. The use of the name "Soapine" is, we believe, protected by law.

(56) D. E. X. asks how small steel springs can be blued to make a first class job? A. After the springs are hardened and tempered, run them through wheels of cotton, or rags of cotton, charged with rottenstone or any other abrading material which will leave them bright, and then heat them in hot sand to color, quenching instantly in cold water.

(57) A. F. L. asks how to make a sand blast, how to get or construct a bellows? A. You will require about one pound pressure for your sand blast. You will also need power for driving the bellows or blower. For a very small arrangement a circular bellows might do. A Root blower would do better, or you might make a gas holder after the principle of those at the gas company, or you might make a water jet from the city water works, like an injector with a siphon to carry off the water under the required pressure. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 416.

(58) C. G. C. asks: Can you inform me through your paper of a good process for casehardening cast iron? A. If the casting is too large to be conveniently packed in a box with cementing material—ground bone, rawhide, etc.—heat it to a red heat and sprinkle powdered prussiate of potash on it, and before it cools plunge it into a cold water bath.

(59) E. S. S. asks in what position the sounding post of the violin should be placed to get best effect? Also of what material it should be made? A. Make the pin of spruce, place it under the bridge step on the right hand side or under the E string.

(60) C. D. asks: 1. Can I use No. 36 cotton-covered wire in making induction coil described in SCIENTIFIC AMERICAN SUPPLEMENT? A. It can be used, but silk-covered is to be preferred. 2. How much would I require of both kinds, covered or uncovered, for both secondary and primary coils? A. Use the quantity mentioned in the SUPPLEMENT referred to.

(61) B. W. D. asks: What adherent force could a magnet be made to have, and what size would be necessary for a force of from 10 to 30 or 40 pounds, if such is possible? Can such be procured? Would it adhere to rubber as well as iron? A. A magnet has no appreciable effect on rubber. A compound, permanent magnet 10 inches long ought to sustain 40 pounds or more.

(62) N. P. B. asks: 1. Will an induction coil one-fourth the size of that described in SUPPLEMENT 160 charge a Leyden jar, said coil being run by one cell of Law's battery? A. It would charge a Leyden jar feebly. 2. How do the iron battery, and the battery composed of niter with iron and coke electrodes, work with an induction coil? A. Any battery with sufficient current will operate an induction coil. 3. Would common spirits of niter do for the latter battery? A. No. Use nitrate of potash. 4. What is the proper thing to fasten the tin foil to the outside of a Leyden jar? A. Use shellac varnish. 5. What makes the fixed stars twinkle? A. Atmospheric disturbances.

(63) A. K. writes: I claim that the vapor arising from gasoline will ascend, the same as any other vapor; M. claims that it will go down. A. It has been found that benzine vapors, which are frequently the cause of fires in paint factories, seek the lowest levels, which they follow for long distances; and it has been shown that a fire in a furnace, the grate of which was but a few inches above the ground or floor, has ignited benzine vapors that came from a tank 200 feet away, a thin stratum of gas following the line of the floor that distance.

(64) H. N. H. asks of what is phosphorus formed, how obtained, and is there any other substance as easily ignited, and how? A. A very full description of the properties and methods by which phosphorus is manufactured is given on page 1,029 of SCIENTIFIC AMERICAN SUPPLEMENT No. 65, and also on page 1,657 of SCIENTIFIC AMERICAN SUPPLEMENT 104. Phosphorus melts at about 99° to 100° F., but potassium becomes spontaneously ignited when exposed to the air.

(65) R. S. B.—Caustic soda is obtained by treating or decomposing dilute solutions of sodium carbonate by means of quick lime. Its manufacture will be found described very completely in "Dussauce's Treatise on the Manufacture of Soap," or in Geo. Lunge's work on the alkalies. Sufficient general information will be found in Spons' encyclopedia or Ure's dictionary.

(66) H. & B. ask what the ingredients are for making a white stain for shoe bottoms? A. Use a stain consisting of soft water one pint, oxalic acid two tablespoonfuls, or more if stronger be required, then dissolve and add a sufficient quantity of flake white. This we think will prove satisfactory.

(67) F. L. O. writes: 1. Will you please tell me where to put my water gauges in building a boiler of mercury flasks, as described in SUPPLEMENT 182? A. The water line should be about 3 inches below upper end of lower flasks. 2. And what amount of steam I can carry with safety? A. 150 pounds per square inch will be quite safe.

(68) G. S. L.—Tellurium is sold as a curiosity at about $72.00 per oz. It has no recognized market value, as there is no demand for it.

(69) B. F. B. asks: Is common salt good to mix with oil to prevent an explosion? A. We have never heard that salt mixed with oil would prevent explosions.

(70) G. S. M. asks what the thermostats are made of that are used for regulating purposes? A. Some thermostats consist simply of a rubber bar. Some of a compound bar of strips of brass and iron riveted together. Others are simply large thermometers.

71) R. W. J.—The principal use of tripoli is for polishing powders; it is, also, sometimes used to give body to soap. At one time it came largely into use in the manufacture of giant powder, but its use for this purpose is now supplanted by wood pulp. It is not bought. Those who sell it own their own mines, and, therefore, it has no market. Under the trade name of Electro Silicon it is largely sold by a company on John Street, New York, but they have more than they can dispose of.

(72) A. L. asks how to make dark resin clear, and how to clean resin that is full of dirt, leaves, and bark? A. Melt it and strain through a suitable filtering material, or else dissolve in turpentine, and filter.

(73) P. R. R. asks: With what white substance can I cover a draughting board that I may easily erase the black pencil lines after the drawing has been copied or used? A. For this purpose paint the board with three or four coats of white lead ground in Japan. Rub each coat down after it is thoroughly dry with powdered pumice stone and water.

(74) A. W. B.—You can put your push button, your bells, and battery all in one circuit, if you do not object to both bells ringing at the same time. If you want to ring the bells independently, you must divide your circuit just below the lower bell and run two wires to the top floor and place a push button on each. Both push buttons may be connected with the same return wire. Cost of bells, from $1.50 upward. Push buttons, 35 cents and upward. Battery, $1.25 to $1.50 per cell.

(75) J. D asks: 1. Is there any means of restoring the oxygen to worn out prisms of the Leclanche battery? A. No. 2. By making and breaking the line circuit of a telephone you hear a faint click in it; is that produced by atmospheric electricity accumulated on the line? A. Earth currents and atmospheric electricity. 3. The objects in my nickel bath sometimes turn black, what is the trouble? A. Possibly your current is too strong. 4. Can I gain time by warming my nickel bath? A. Yes. 5. In a high speed engine, the piston, piston rod, and part of connecting rod come so many more times from their state of rest to a higher velocity, and again to rest, than a low speed engine. Is there not a loss of energy on account of the inertia of piston and connections, and consequently a low speed or rotary engine more economical than an ordinary high speed engine? A. The inertia is counteracted by lead or cushion. There is no very marked difference in economy. The present tendency among engineers is to high pressure and high speed.

(76) A. K. asks: What preparation they put on silver leaf that makes it look like gold, such as that on cheap mouldings? A. You can purchase a gold lacquer from large paint houses that will accomplish your purpose. A pale gold lacquer of 1 gallon of methylated alcohol, 10 oz. of seed lac bruised, and half ounce of red saunders dissolved and strained is often used.

(77) J. G. W. asks for a recipe for red-edging or gilt-edging books? A. The book is very firmly clamped between the arms of a press, so that none of the coloring materials shall penetrate among the sheets. The edges are then coated by means of a camel's hair brush with a mixture of carmine and a suitable shade of aniline red with sufficient gum arabic to thicken the solution. The ingredients vary according to the shade desired. In the case of gilt-edging the leaves are first coated with a solution of white of egg, gold leaf is then put on, and finally burnished with a tool tipped with agate.

(78) C. G. D.—The usual process of nickel plating is described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 310, under the title of Electro-metallurgy. It is necessary to polish the plating, and for this purpose rouge and buffers are generally employed. We would recommend you to read some of the works on the subject, such as Wahl's "Galvanoplastic Manipulations," recently published. See page 109 of SCIENTIFIC AMERICAN, current volume.

(79) C. E. P.—Your general conjecture about the minerals is correct. As regards tin, from a rough qualitative test, traces of it appeared present. We would suggest that a larger quantity of the mineral be forwarded and sufficient money ($5.00) be included, so that an assay could be made, by means of which the working amount of the metal could be determined.

(80) C. H. L. asks: Can you give me any information of Cooper Institute, and the conditions on which students are admitted? And is it so fixed that a student can earn his board and clothes? A. There is no bar to any student of good character entering the classes of the Cooper Union. Only ladies can enter the classes in engraving. They can earn the value of their work for themselves. There is no other means of earning anything within the Union. You may obtain a situation at any employment in the city, and attend the evening classes.

(81) S. W. R. writes: 1. What is the matter with my plating bath? I prepared it by dissolving 4½ oz. of nickel ammonium sulphate in 3 pints of water, according to SCIENTIFIC AMERICAN SUPPLEMENT No. 310. It plates dark, and when polished looks like lead. It seems to take a good deal more battery power than does the silver bath, is very hard to polish at all, and I understand should look nearly like silver. A. You are probably using too much current. Try a weak battery. 2. What will an induction coil 2 x 1¼ do? A. It depends upon the construction of the coil and the amount of battery employed.

(82) F. K. asks: 1. What is the best conductor of heat, that is, what material will retain the most heat the longest? A. The best conductor of heat according to Despretz is gold, and according to Wiedemann and Franz, silver. 2. What is the best non-conductor of heat, or just the opposite of the other? A. The best non-conductors are asbestos, mineral wool, paper, soapstone, and animal wool and hair. 3. Will an electric machine, if made in the lightest practical form and material, lift more than its own weight, and if so, how many times its own weight would it lift? A. An electro motor will lift almost any weight by means of a windlass or equivalent device. Time is an element which you do not consider. A light dynamo should sustain several times its own weight when used in connection with a suitable electromagnet. Your query is hardly clear enough to enable us to give you a definite reply.

(83) B. H. writes: If a perpendicular pipe one inch square surface be connected with a horizontal pipe of the same size, at right angles, both filled with water, and the perpendicular pipe be brought under pressure of ten pounds, the pressure in the horizontal pipe will be the same, viz., ten pounds. If ten pipes of the same size should be similarly connected with the horizontal pipe, and the water in each pipe brought under a pressure of ten pounds, would the pressure in the horizontal pipe be $10 \times 10 = 100$ pounds, or only 10 pounds? A. If the ends of the pipes are closed the pressure in the horizontal pipe will also be ten pounds plus the hydrostatic pressure caused by the height of water in the upright tubes; which adds one pound for every twenty-seven inches in height. The number of pipes does not affect the question.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. H. G.—The specimen is pyrite or iron sulphide, in a coaly slate or shale. It is not likely to be of any value.—R. T. B.—The mineral sent is magnetite, or magnetic oxide of iron. It is one of the most valuable iron ores that is found.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

March 25, 1884,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising articles to cards, attaching, S. P. Mount ... 295,665
Air compressor, hydraulic, C. Pfanne ... 295,800
Alarm. See Fire alarm.
Animal trap, C. Hall ... 295,634
Antiseptic solution, J. F. Kennedy ... 295,876
Asphalt, machine for mixing, G. Winding ... 295,707
Bag. See Mail bag.
Bait, spoon, C. B. Hibbard ... 295,758
Baling press, J. D. Page ... 295,672
Ballot box, J. Klinger ... 295,560
Battery. See Galvanic battery.
Bee hive, J. Vanzandt ... 295,693
Bee hives, moth trap for, J. T. McElfresh ... 295,786
Belt stud, O. S. Turner ... 295,599
Blacking box, A. V. Sandford ... 295,677
Blasting barrel, G. A. Ingram ... 295,556
Block. See Saw mill head block.
Blotter, A. H. Frederick ... 295,625
Body protector, W. Gray ... 295,543
Boiler scraper, J. H. Beare ... 295,854
Bolting chest, Kohnle & Hamilton ... 265 561
Boot or shoe toe cap, F. H. Kennedy ... 295,877
Borer, hand, W. E. Clough ... 295,523
Boring machine, W. E. Clough ... 295,524
Bottle lips and necks, tool for forming, J. B. Wilson ... 295,848
Bottle stopper, A. H. Wirz ... 295,708
Bottles, cutter for wires and cords of, Bevins & Propst ... 295,721
Bottles, machine for wiring corks in, O. C. Carpenter ... 295,735
Bouquet and ticket holder, combined, W. H. Hogan ... 295,870
Box. See Ballot box. Blacking box. Fish box.
Bracket. See Toilet bracket.
Brake. See Vehicle brake.
Bran and feed packer, S. B. Ellithorp ... 295,863
Brick, A. Trochsler ... 295,692
Brick and tile kiln, W. A. Eudaly ... 295,744, 295,864
Brick and tile machine, A. Horrocks ... 295,871
Brick machine, P. H. Kells ... 295,558
Bridle and halter combined, H. Rorebeck ... 295,812
Broom band, J. Smith ... 295,685
Buckle, F. Armstrong ... 295,714
Bustle, J. B. Phillips ... 295,584
Button, P. Kalish ... 295,769
Button fastener, M. H. McNair ... 295,575
Button fastener, W. H. Wood ... 295,709
Button fastener staples, implement for setting, J. H. Goodfellow ... 295,539
Button hook or fastening, F. A. Smith, Jr. ... 295,828
Button machine, G. R. Williams ... 295,705
Buttons, etc., attaching, J. F. Thayer ... 295,593
Cabinet maker's clamp, W. E. Sheldon, Jr. ... 295,589
Camera. See Photographic camera. Solar camera.
Can. See Fruit, vegetable, and meat can.
Cane and cigar case, combined, D. Lee, Jr. ... 295,654
Capstan bars, etc., rack for holding, Foster & Hanford ... 295,746
Car coupling, F. K. Adams ... 295,609
Car coupling, N. P. Cowell ... 295,618
Car coupling, Duffy & McIvor ... 295,860
Car coupling, Huber & Barnhart ... 295,763
Car coupling, S. D. Lee ... 295,773
Car coupling, J. Shanaman ... 295,588
Car coupling, L. E. Sloan ... 295,684
Car coupling, G. W. Smith ... 295,329
Car coupling, W. H. Ward ... 295,697
Car coupling, H. B. Williams ... 295706
Car, safety railway, E. Henn ... 295,637
Car warmer, chemical, C. Mitchell ... 295,576
Car wheel, Melvin & Clute ... 295,790
Car window curtains, device for holding, F. Furness ... 295,535
Cars from one track to another, mechanism for guiding, J. A. Heyl ... 295,640
Carpet stretcher, W. A. Skinner ... 295,824
Carrier. See Cash carrier.
Cash carrier for stores, C. M. Johnson ... 295,645
Caster, E. T. Thomas ... 295,689
Caster, W. Zimmer ... 295,850
Chain link, ornamental, S. L. Lederer ... 295,772
Chain tip, watch, H. M. Herring ... 295,869
Chandelier, extension slide, J. P. Bonner ... 295,519
Chimney cowl, E. R. Stasch ... 295,687
Chuck, lathe, J. S. Gilmore ... 295,628
Churn, W. H. Dyer ... 295,862
Churn, A. Jackson ... 295,766
Churn motor, H. C. Sadler ... 295,587
Clamp. See Cabinet maker's clamp.
Clasp. See Rope or line clasp.
Claw bar, W. H. Lyman ... 295,571
Clay crushing machine, F. E. Frey ... 295,533
Cleaning textile fabrics, wooden and metallic surfaces, etc., composition for, F. S. Monroe ... 295,882
Clock, alarm, J. Ganss ... 295,627
Clocks, electric alarm for spring, E. Jungerman ... 295,873
Clover huller cylinder, Land & Campbell ... 295,771

© 1884 SCIENTIFIC AMERICAN, INC

Clutch guard, D. Tilton..... 295,595
Collar or tie readjuster, W. W. Deniston..... 295,526
Colors, machine for sifting, J. C. Matter..... 295,783
Converter, T. Griffiths 295,544, 295,545
Converter employed in the manufacfure of iron and steel, T. Griffiths..... 295,546
Conveyer, screw, F. C. Caldwell..... 295,731
Cork cutting machine, F. J. Nutting..... 295,884
Corn from the cob, machine for cutting green, D. B. Speer..... 295,831
Corn in the cob, machine for cutting, S. F. Savits. 295,819
Cot, folding, W. H. Wooldridge..... 295,606
Counting register, Jones & Cooper..... 295,768
Coupling. See Car coupling. Electric wire coupling. Whiffletree coupling.
Cultivator, B. C. Bradley..... 295,520
Cultivator, Long & McBeth..... 295,779
Cultivator, J. Woolridge..... 295,607
Cyclometer, G. H. Gould..... 295,632
Dental vulcanizer, F. W. Seabury..... 295,821
Door plate and mail receiver, combined, Pace & Wev..... 295,581
Doors, hanging, C. W. Emerson..... 295,743
Dredge, R. R. Osgood..... 295,580
Drier. See Grain drier.
Drill. See Ratchet drill. Rock drill.
Egg holder, W. Kearney..... 295,648
Ejector oil, Lawrence & McDonald..... 295,562
Electric implement, A. H. Kinder..... 295,652
Electric machines, apparatus for regulating and distributing currents from dynamo, W. Hochhausen..... 295,552
Electric machines, armature coil for dynamo, J. J. McTighe..... 295,589
Electric machines, driving gear for dynamo, J. W. Boothby..... 295,614
Electric wire coupling, G. L. Kitson..... 295,559
Electric wires, sidewalk curb and surface case for, R. Wylie..... 295,710
Electrode or element, battery, E. T. Starr..... 295,889
Elevator safety stop, E. Saunders..... 295,678
End gate, wagon, Gier & Fincke..... 295,750
Engine. See Gas engine. Rotary engine. Steam. Engine.
Engraving machine, I. R. Beam..... 295,853
Envelope, E. J. Trum..... 295,598
Excavating machine, T. Clark..... 295,522
Fare register, H. Marshall..... 295,781
Faucet screw, M. O'Connor..... 295,794
Feed water heater, B. Webster..... 295,891
Fence, F. Schmitz..... 295,679
Fence stretcher and splicer, wire, J. E. Pierce.... 295801
Fence wire fastening, E. S. Lenox.....295,565, 295,566
Fertilizers, apparatus for making, A. Von Podewils..... 295,695
File, paper, C. W. Sherwood..... 295,591
Fire alarm, automatic, J. Hill..... 295,760
Fire alarm, electric, J. Hill..... 295,759
Fire arm magazine, Lee & Diss..... 295,563
Fire arm magazine, J. Leemann..... 295,564
Fire escape, V. W. Blanchard..... 295,723
Fire escape, R. E. Downie..... 295,527
Fire escape, L. J. Gott..... 295,631
Fire escape, A. W. Lozier..... 295,570
Fish box, C. A. Bergtold..... 295,517
Floor mat, S. Toffler..... 295,839
Folding table, W. W. Quigley..... 295,673
Forging hammers, die for, H. Hammond..... 295,547
Fruit and vegetable washer, J. Baker..... 295,715
Fruit, vegetable, and meat can, J. Baker..... 295,716
Furnace. See Puddling furnace. Reverberatory ore furnace.
Galvanic battery, C. Pabst..... 295,671
Galvanic battery cell, sealed, W. T. McGinnis..... 295,574
Gage. See Splitting gage.
Gas, apparatus for manufacturing illuminating, J. J. Shedlock..... 295,822
Gas engine, H. S. Maxim..... 295,784
Gas pressure regulator, Francis & Tibbs..... 295,582
Gas, process of and apparatus for manufacturing, J. L. Stewart..... 295,832
Gate. See End gate. Railway gate.
Gate, N. B. Huffman..... 295,641
Gate, H. H. Lockling..... 295,569
Gate, E. D. Rathbun..... 295,674
Gearing for changing speed, S. N. Gallup..... 295,536
Generator. See Steam generator.
Glass cutting apparatus, W. H. Walker..... 295,603
Gloves, gaiters, etc., fastener for, C. A. Pfenning. 295,583
Grain and fertilizer distributing apparatus, A. J. Martin..... 295,655
Grain binder, J. H. Anderson..... 295,711
Grain cutting machine, A. Wemple..... 295,699
Grain drier, R. S. Jennings..... 295,643
Grater, nutmeg, L. J. Church..... 295,736
Grinding mill, H. Hungerford..... 295,764
Guard. See Clutch guard.
Hanger. See Shafting hanger.
Hangers to ceilings, implement for attaching, P. Lorillard, Jr..... 295,880
Harness, G. H. Ingalls..... 295,642
Harrow or soil pulverizer, J. Schindler..... 295,820
Harvester, S. D. Locke..... 295,777
Harvester, corn, Wagner & Dryer..... 295,602
Harvester cutting apparatus, E. D. Roth..... 295,813
Harvester rake, S. Johnston..... 295,872
Hasp lock, D. Smith..... 295,827
Hat pouncing machine and lathe, Thompson & George..... 295,690
Hat shaping machine, J. R. Kelsey..... 295,650
Heater. See Feed water heater.
Heating apparatus and drying rack, combined, J. R. Moore..... 295,663
Hinge, brace, A. W. Sangster..... 295,818
Hinge, duplex brace, A. W. Sangster..... 295,871
Hoisting and conveying apparatus, M. W. Locke. 295,776
Hoisting and conveying machine, A. E. Brown.... 295,727
Hoisting gear, J. L. Booth..... 295,725
Hoisting machine, F. Brown..... 295,730
Holder. See Bouquet and ticket holder. Egg holder. Tag or label holder.
Hominy mill, T. Hudnut..... 295,554
Hook. See Snap hook.
Hoop nailing machine, A. C. Batcheller..... 295,516
Horse armor, J. H. Anderson..... 295,712
Horseshoe, M. Caspari..... 295,616
Horseshoe, G. A. Dean..... 295,620
Hot air furnace regulator, electric, F. M. Sparrow 295,686
Hub, wheel, A. M. Brown..... 295,728
Hydrant, B. C. Vanduzen..... 295,600
Ice plows, inserted tooth fastening for, J. G. Bodenstein..... 295,724
Inking apparatus, automatic registering, Jones & Cooper..... 295,767
Ink stand or receiver, J. B. Davids..... 295,739
Jack. See Screw jack.
Kiln. See Brick and tile kiln. Lumber kiln.
Knobs, handle for dial lock, T. L. Paine..... 295,582
Ladder, folding step, A. Bohman..... 295,518
Lamp, double carbon arc, E. Thomson..... 295,836
Lamp, electric, W. Morava..... 295,664
Lamp, hot air oil, C. H. Murray..... 295,566
Latch door, W. F. Oliver..... 295,795
Latch, gate, J. B. Hasenohr..... 295,753
Lathe dog, F. Armstrong..... 295,713
Leather, coloring and bronzing, L. Klöpfer..... 295,653
Leg, artificial, K. R. Collins..... 295,615
Leggin, J. N. Goldbacher..... 295,538
Light. See Marine signal light.
Lock. See Hasp lock. Seal lock.
Lock, F. W. Mix..... 295,660
Log turner, S. T. Haviland..... 295,549
Lubricating device for cutter bars, E. D. Roth.... 295,814
Lubricator, N. H. Heft..... 295,757
Lubricator, L. C. Nielsen..... 295,793
Lumber kiln, E. Myers..... 295,667
Magneto and dynamo electric machine, F. G. Frick..... 295,534
Mail bag, S. O. Campbell..... 295,733
Map stand, revolving, H. E. Hayes..... 295,686
Marine signal light, Baker & Roberts..... 295,717
Marker, land, A. W. Hitchcock..... 295,761
Mat. See Floor mat.
Mat, R. Martinez..... 295,782
Matrices, machine for making, R. L. Kimberly... 295,878
Measuring incompressible fluids, machine for, J. E. Crisp..... 295,858
Metal bending machine, H. A. Ainsworth..... 295,851
Metals from ores and metallurgical products, extracting, E. H. Russell..... 295,815
Metals from ores and metallurgical products, separating, E. H. Russell..... 295,887
Microscope, W. K. Kidder..... 295,770
Middlings, etc., bolt for purifying, O. P. Hurford. 295,555
Mill. See Hominy mill.
Mill feeding device, J. B. Allfree..... 295,852
Mines, winding apparatus for, A. Lindenberg..... 295,774
Moldings, machine for dressing, J. C. Brandon... 295,726
Motor. See Churn motor.
Musical instruments, water key for brass, J. Heald 295,756
Musical wagon, H. J. D. Miner..... 295,659
Nailing machine, E. F. Barton..... 295,515
Needle, shoe button, E. A. Bailey..... 295,612
Oil, removing oleine from linseed, T. H. Gray..... 295,633
Ores, purifying hyposulphite solutions used in leaching, E. H. Russell..... 295,886
Organ, reed, J. B. Hamilton..... 295,868
Overalls, W. A. Dawson..... 295,619
Oysters, machine for opening, L. A. Amouroux... 295,611
Packer for oil wells, gas and water, E. B. Frew... 295,747
Packing, asbestus joint, W. A. Fries..... 295,748
Packing, asbestus steam, W. A. Fries..... 295,749
Paint mills, cooling apparatus for, Fuller & Macauley..... 295,626
Paper, cloth, etc., manufacture of wood grain, G. F. & J. W. McIndoe.....295,657, 295,658
Paper folding machines, tension device for tapes of, J. H. Stonemetz..... 295,834
Paper from grain cuticles, manufacture of, W. L. Teter..... 295,835
Paper pulp, manufacture of, D. O. Francke..... 295,865
Parachinanisol, manufacture of, Z. H. Skraup..... 295,825
Parer, fruit, Keigwin & Talley..... 295,874
Pavement, wood, R. Albrecht..... 295,610
Pencil pointing device, H. G. Schramm..... 295,680
Photographic camera, A. Herzog..... 295,638
Photographic pictures, printing and mounting, J. D. Terreforte..... 295,688
Piano forte stringing device, J. R. Lomas..... 295,778
Piano hammer, E. R. Ober..... 295,670
Planter check rower, corn, J. P. Moos..... 295,883
Planter fertilizer distributer, seed, A. C. Evans... 295,528
Planter fertilizing attachment, seed, A. C. Evans. 295,529
Planter, hand seed, A. Hoag..... 295,762
Planter, potato, J. P. Wick..... 295,846
Planter, seed, W. L. Hutson..... 295,765
Plow, Wiard & Bullock..... 295,702
Plow, sulky, S. W. Barr..... 295,613
Plow, sulky, W. McNary..... 295,788
Pool rack, H. W. Collender..... 295,857
Power, device for transmitting, A. D. Whitton.... 295,701
Precious metals from ores, extracting, E. H. Russell..... 295,816
Press. See Baling press.
Press board finishing machine, F. L. Case..... 295,521
Printing plates, making lithographic, P. C. Möller 295,561
Projectile for carrying high explosives, F. H. Snyder..... 295,830
Puddling furnace, rotary, J. Hall, Jr..... 295,751
Puddling furnaces, water joint for rotary, Griffen & Hall, Jr..... 295,867
Pulley, F. C. Caldwell..... 295,732
Pulley, O. R. Olsen..... 295,796
Pulley, Waterous & Peel..... 295,698
Pulley, friction, V. W. Mason..... 295,656
Pulverizing apparatus, L. S. Chichester..... 295,856
Pulverizing machine, L. S. Chichester..... 295,617
Pump, L. G. Careaga y Saenz..... 295,734
Pump, air, G. Ross..... 295,676
Pump, hollow piston, J. F. Hess *et al*..... 295,639
Pump, rotary, F. S. Troutman..... 295,597
Pump, rotary, J. M. Wiles..... 295,704
Pumps, valve gear for hydraulic, G. W. Dickie... 295,622
Radiator, steam, E. T. Weymouth..... 295,700
Railway crossing, D. Lippy..... 295,568
Railway crossing, Wallack & Rohrer..... 295,844
Railway gate, L. C. Walsh..... 295,696
Rat trap for buildings, T. M. Beverage..... 295,720
Ratchet drill, J. H. Vinton..... 295,694
Ratchet wrench, A. E. Osborn..... 295,797
Razor strop, J. R. Torrey..... 295,840
Register. See Counting register. Fare register.
Regulator. See Gas pressure regulator.
Reverberatory ore furnace, G. W. Jones..... 295,646
Rock, drill, Coe & Hoffnagle..... 295,737
Rock drill, H. C. Sergeant..... 295,682
Rolling threads on metal, machine for, Wilson & Haskins..... 295,605
Roofing composition, W. White..... 295,604
Rope or line clasp, A. L. Pitney.....295,802, 295,803
Rotary engine, J. T. Davis..... 295,859
Rubber waste for the recovery of the rubber or caoutchouc therefrom, treating fibrous, A. O. Bourn..... 295,615
Saddle board, J. A. Wilson..... 295,847
Saddle, riding, W. Frazier..... 295,623
Saddle tree, harness, L. A. Ringwalt..... 295,810
Sash balance, M. B. Gladman..... 295,630
Sash fastener, S. Farquhar..... 295,530
Saw guide, T. J. Neacy..... 295,792
Saw mill, D. F. & J. T. Milne..... 295,791
Saw mill head block, Martin & Metcalfe..... 295,572
Saw tooth, R. W. Kellen..... 295,649
Scaffolding, T. N. Subers..... 295,592
Scaffolding attachment, J. T. O'Brien..... 295,578
Scaffolding, interior and exterior, J. T. O'Brien... 295,579
Scale, coin and letter, C. Richtmann..... 295,809
Scale pan, folding, W. Maguire..... 295,785
Scissors and shears, W. J. Bayrer..... 295,718
Scraper runner, L. D. York..... 295,892
Screw jack, A. R. Tiffany.....295,837, 295,838
Screw, wood, G. A. Stiles..... 295,833
Seal lock, A. B. Barnard..... 295,514
Seed drill feed, W. H. Julian..... 295,647
Sewer basin, W. Sievering..... 295,823
Sewing machine feeding mechanism, C. W. Healey 295,551
Shade roller, spring, D. E. Kempster..... 295,875
Shafting hanger, J. E. Hoppen..... 295,553
Shingle sawing machine, S. L. Bitting..... 295,722
Shingle shaving and rifting machine, A. Gould.... 295,541
Shoe, W. S. Freeman..... 295,624
Shoes, manufacture of, G. W. Sleeper..... 295,826
Skins, machine for putting out or stretching, B. McKeen..... 295,787
Sled propeller, C. Bernhard..... 295,719
Smoke, apparatus for and process of consuming, W. Vogel..... 295,842
Snap hook, J. H. Shaw..... 295,683
Solar camera, C. F. Adams..... 295,608
Soldering machine, can, D. M. Monroe..... 295,662
Soldering tool, W. M. Ryan..... 295,888
Speculum, G. W. Pagett..... 295,798
Spinning and twisting machine, C. A. Coggeshall. 295,738
Splitting gage, H. S. Ginther..... 295,629
Stamp, canceling, E. B. Brown..... 295,729
Stand. See Map stand.
Steam engine, G. F. Seiser..... 295,681
Steam generator, D. M. Graham..... 295,542
Steam generator, F. Livet..... 295,775
Steam trap, G. B. McCracken..... 295,573
Stereotype plate, F. K. Tracy..... 295,596
Sugar, manufacture of, K. Trobach..... 295,841
Swivel for watch chains, P. Nerney..... 295,577
Swivels, device for finishing chain, J. E. Walcott.. 295,843
Syringe, vaginal, J. A. Hawley..... 295,755
Table. See Folding table.
Tag, M. W. & J. D. Kase..... 295,557
Tag or label, W. P. Patton..... 295,799
Tag or label holder, A. Hanvey..... 295,752
Telegraph, printing, A. F. Johnson..... 295,644
Telegraphic system, C. G. Burke..... 295,855
Telephone support, G. W. Fish..... 295,531
Telephone transmitter, D. Drawbaugh.....295,741, 295,742
Telephonic receiver, C. A. Randall..... 295,804
Telephonic transmitter, C. A. Randall...295,805 to 295,807
Thrashing machine grain separator, P. L. Nash... 295,668
Tobacco in licorice, apparatus for dipping, E. F. Maffrand..... 295,780
Toilet bracket, C. Lindner..... 295,567
Tongs, pipe, H. S. Pullman..... 295,885
Toy, J. A. Ward..... 295,845
Trap. See Animal trap. Rat trap. Steam trap.
Tricycle, D. E. Dutrow..... 295,861
Trunk, F. H. Ransom..... 295,808
Tuyere, F. W. Gordon..... 295,540
Tuyere, J. F. Harly..... 295,548
Umbrellas and cases, hand protecting attachment for, E. Ross..... 295,586
Valve, steam actuated, D. F. Nisbet..... 295,669
Valves, apparatus for testing safety, G. W. Richardson..... 295,585
Vapor burner safety attachment, R. S. Kelsey.... 295,651
Vaporizing hydrocarbon oils, process of and apparatus for, H. F. Hayden..... 295,550
Vehicle brake, J. T. Dillehay..... 295,740
Vehicle seat, G. B. Haskell..... 295,754
Vessel, tilting, W. Zimmer..... 295,849
Wagon, dumping, W. & J. H. Leonhardt..... 295,879
Wagon, spring board, J. C. F. Harris..... 295,635
Warping machine, G. S. Follansbee..... 295,745
Water closet valve, H. A. Tobey..... 295,691
Water, purifying, W. Tweeddale..... 295,890
Water wheel, turbine, I. Sherck..... 295,590
Waterproofing and preserving buildings, compound for, B. De Nise..... 295,525
Waterproofing composition, A. Mink..... 295,881
Weather strip, E. E. Gillett..... 295,537
Well boring and drilling machine, F. Dearmin.... 295,621
Wheel. See Car wheel. Water wheel.
Whiffletree, J. Graves..... 295,866
Whiffletree, H. Rorebeck..... 295,811
Whiffletree coupling, O. Vanorman..... 295,601
Window, safety, F. O. Thiem..... 295,594
Wire barbing machine, G. C. Baker..... 295,513
Wooden tubing, smoothing the inner surface of, M. F. Wilcox..... 295,703
Wrench. See Ratchet wrench.

DESIGNS.

Basque, lady's, C. O'Hara..... 14,917
Button, sleeve, F. F. & J. C. Bioren..... 14,897
Carpet, E. Fisher..... 14,898
Carpet, E. C. Frost..... 14,899
Carpet, H. Horan..... 14,903 to 14,909
Carpet, J. McMann..... 14,913
Carpet, H. North..... 14,914, 14,915
Carpet, L. W. Valentine..... 14,923
Costume, girl's, C. Shiels..... 14,921
Costume, miss's, S. J. Shiels..... 14,922
Ear ring pendant, J. B. Van Houten..... 14,924
Furniture back frame, F. Masset..... 14,912
Mitt, W. P. Jennings..... 14,910
Musical instrument case, M. Gally..... 14,900
Ornamentation of textile and other fabrics, Hirsch & Marx..... 14,902
Polonaise, lady's, J. Q. Reed..... 14,920
Shoe or slipper, C. B. Hatfield..... 14,901
Skirt, lady's, C. O'Hara..... 14,918
Spoon or fork handle, G. B. Kelley..... 14,911
Watch movement, G. Perregaux..... 14,919
Wrap, lady's, C. O'Hara..... 14,961

TRADE MARKS.

Brushes, hat, G. Bossange..... 11,029
Cigars and cigarettes, H. Segnitz & Co..... 11,034
Cigars, cigarettes, and smoking tobacco, Kaufmann Bros. & Bondy..... 11,032
Cough remedies, Kerry, Watson & Co..... 11,033
Food made from grain, article of, Glaser, Kohn & Co..... 11,046
Liquors and spirits, Cusenier Fils Aine & Co.11,035, 11,036
Soap, laundry, Procter & Gamble.....11,038 to 11,042
Steel and certain implements made therefrom, W. K. & K. K. Peace..... 11,037
Varnishes, japans, blacks, colors, paints, wood linings, and rough stuffs, Valentine & Company.. 11,047
Whisky, B. J. Semmes & Co..... 11,043, 11,044
Whisky, rye and bourbon, S. C. Herbst..... 11,030, 11,031
Whiting, prepared, A. Buel..... 11,045

A printed copy of the specification and drawing of any patent in the foregoing list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 261 Broadway, New York. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the forse going list, at a cost of $40 each. For full instruction address Munn & Co., 261 Broadway, New York. Other foreign patents may also be obtained.

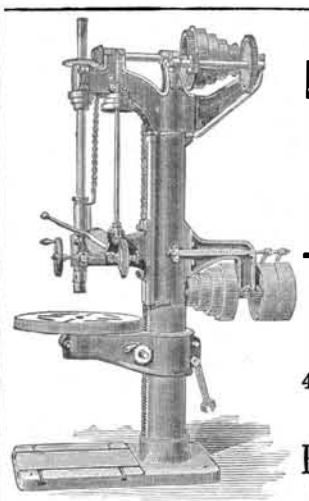
Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)
Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

GET THE BEST AND CHEAPEST.
TRADE PERIN MARK.
Silver Finish.
J. A. FAY & CO.
J. A. FAY & CO.,
(Cincinnati, Ohio, U. S. A.)
Exclusive Agents and Importers for the United States, of the
CELEBRATED
PERIN BAND SAW BLADES,
Warranted *superior to all others in quality, finish, uniformity of temper,* and *general durability.* One *Perin Saw* outwears *three* ordinary saws.

FOSSIL MEAL
COMPOSITION.
THE LEADING NON CONDUCTING
COVERING FOR BOILERS, PIPES &c
With 5/8 to 3/4 inch thickness it radiates less heat than any other covering does with 2 inches.
Fossil Meal is by far the lightest Cement Covering known, is very durable, absolutely fire proof, and is easily applied.
Sold in a dry state by the pound.
FOSSIL MEAL TUBES
for Cold Water and Refrigerator Pipes.
FOSSIL MEAL COMPOUND
for Lining of Icehouses and filling in of Safes.
Send for Circulars.
FOSSIL MEAL CO.,
48 Cedar Street,
New York.
Reliable parties, desiring to take the Agency for their respective territory, will apply in writing, giving references.

HEAT IN RELATION TO CHEMICAL Action. By Henry Allen. A review of some of the results that have recently been obtained by experimenters in the branch of physics known as thermo-chemistry. Description of apparatus used by M. Berthelot in his calorimetric determinations. The fundamental principles of thermo-chemistry explained. Decomposition of water by metals. Action of hydrochloric acid. Sulphides. Nitric acid. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 291. Price 10 cents. To be had at this office and from all newsdealers.


UPRIGHT
DRILLS
ALL SIZES.
BORING
—AND—
TURNING
MILLS,
48 and 72 inch swing.
H. BICKFORD
Cincinnati, Ohio.

MUNSON'S PORTABLE MILLS,
AND MILL FURNISHINGS,
MANUFACTURED BY MUNSON BROTHERS,
UTICA, N. Y., U. S. A.

WOOD WORKERS!
Send for a copy of **Shavings and Sawdust.** It treats of the care and operation of all classes of woodworking machines. It is the work of a practical man who has spent many years in the mill operating them, and in the shop building them. There is not a dry page in it. It is written in a bright, gossipy, conversational style. Theory finds no place in it. Substantially bound in cloth; 150 pages; illustrated. $1.50 by mail, postpaid. Address C. A. WENBORNE, Publisher, Buffalo, N. Y.

BUGGIES for the TRADE. Territory given. ENTERPRISE CARRIAGE CO., Cincinnati, O. Catalogue FREE.

SOUTH AFRICA.—A PORT ELIZABETH FIRM, having agents in all parts of the Cape Colony, Orange Free State, Transvaal, is desirous to introduce a PATENT NOVELTY. Address F. F. D., Post Office Box 233, Port Elizabeth, South Africa.

ROOFING
For buildings of every description. Durable, light, easily applied, and inexpensive. Send for sample. N. Y. COAL TAR CHEMICAL CO., 10 Warren St., New York.

© 1884 SCIENTIFIC AMERICAN, INC

VALUABLE BOOKS FOR PRACTICAL MEN.

Michell.—Mine Drainage: A complete practical treatise on Direct-acting Underground Steam Pumping Machinery. Illustrated. 137 engravings, 8vo, . $6.00

Molesworth Pocket Book of Useful Formulæ and Memoranda for Civil and Mechanical Engineers. Leather, ... $1.00

Neville Hydraulic Tables, Coefficients, formulæ for finding the discharge of water from orifices, notches, weirs, pipes, and rivers. Thick 12mo, . . $3.50

Nicoll's Railway Builder. A Hand Book for estimating the probable cost of American Railway Construction and Equipment. Full bound pocket book, gilt edges, ... $2.00

O'Neill.—A Dictionary of Dyeing and Calico Printing 8vo, 491 pages, ... $5.00

Orton.—Underground Treasures; How and Where to Find them. Illustrated, ... $1.50

Overman.—The Manufacture of Steel. A new edition edited by A. A. Fesquet, ... $1.50

Overman.—The Moulder's and Founder's Pocket Guide. A new addition with a supplement on Statuary and Ornamental Moulding, Ordnance, Malleable Iron Castings, etc. By A. A. Fesquet. 44 engravings, 12mo, ... $2.00

Painter, Gilder, and Varnisher's Companion, comprising painting, gilding, varnishing, glass staining, graining, marbling, sign writing, gilding on glass, coach painting and varnishing, harmony and contrast of colors. 12mo, ... $1.50

☞ *The above or any of our books sent by mail free of postage, at the publication price to any address in the World.*

☞ Our new and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS, 96 pages, 8vo, CATALOGUE OF BOOKS ON STEAM AND THE STEAM ENGINE, MECHANICS, MACHINERY, AND DYNAMICAL ENGINEERING, CATALOGUE OF BOOKS ON CIVIL ENGINEERING, BRIDGE BUILDING, STRENGTH OF MATERIALS, etc. List of LEADING BOOKS ON METAL MINING, METALLURGY, MINERALOGY, ASSAYING, AND CHEMICAL ANALYSIS, etc., etc. Catalogue of Books on DYEING, CALICO PRINTING, WEAVING, COTTON AND WOOLEN MANUFACTURE; CATALOGUE OF A MISCELLANEOUS COLLECTION OF PRACTICAL AND SCIENTIFIC BOOKS; two Catalogues of Books and Pamphlets on SOCIAL SCIENCE, POLITICAL ECONOMY, BANKS, POPULATION, PAUPERISM, and kindred subjects; sent free to any one, in any part of the world, who will forward his address.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers, and Importers,
810 Walnut St., Philadelphia, Pa.

Cornell University.

COURSES IN

Electrical Engineering,
Mechanical Engineering,
Civil Engineering
and Architecture.

Entrance Examinations Begin at 9 A. M., June 16 and Sept. 16 1884.

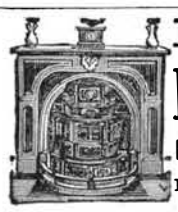
For the UNIVERSITY REGISTER, containing full statements regarding requirements for admission, courses of study, degrees, honors, expenses, free scholarships, etc., and for special information, apply to THE TREASURER OF CORNELL UNIVERSITY, Ithaca, N. Y.

STEPHENS' VISES.

(FLAT AND SWIVEL BASES.)
SOLID JAWS AND ADJUSTABLE ATTACHMENTS.

Steel Faced or Solid Steel Sliding Bar. Especially adapted for **heavy chipping and locomotive works.** For **Jewelers** and every kind of **vise** work it maintains its **superiority in strength, firmness of grip, durability, make, and saving of time and labor.** For sale by the Trade. Send for Circular.

NATHAN STEPHENS, Prop.,
41 Dey Street, New York.



BIBB'S
Great Original Baltimore-Made
Fire Place Heaters
Mantels and Registers.
B.C. BIBB & SON,
Baltimore, Md.
Best workmanship. Lowest prices guaranteed. Send for circulars.

PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

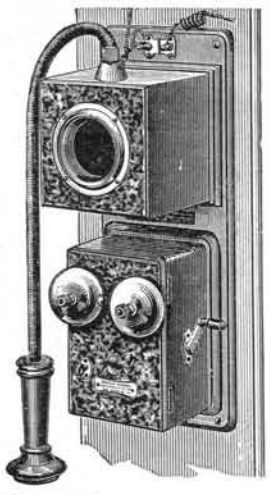
In this line of business they have had *thirty-eight years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York.

BRANCH OFFICE.—Corner of F and 7th Streets, Washington, D. C.



The BENNETT PRIVATE LINE TELEPHONE APPARATUS

CONSISTING OF THE

BENNETT TRANSMITTER, BENNETT-LAKIN RECEIVER, GILLILAND MAGNETO BELL, INSULATORS, ETC.

Forming a Handsome, Practical, Durable, and Reliable Telephone Apparatus for Short Private Lines, **UNEQUALED** in every particular. Our apparatus has been greatly improved, and for short lines is **WITHOUT A RIVAL,** and is **GUARANTEED SUPERIOR** in every respect to anything else in use. With our new Illustrated Book of Instructions, any one with ordinary ingenuity can easily put them up.

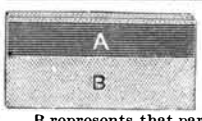
Our U. S. Patents, six in number, cover broadly the use of a Curved Tube in the Transmitter, the use of a Hearing Tube in connection with a Telephone, our Improved method of Insulating, our Magneto Bells, etc. Any other Telephone embodying the above features is a direct infringement, and the maker, seller, and user will be proceeded against.

Send for our New Catalogue and Price-List just issued.

BENNETT TELEPHONE CO.,
Indianapolis, Ind., U. S. A.

INSTRUMENTS SOLD OUTRIGHT. Please mention this paper.

DROP FORGINGS
BILLINGS & SPENCER CO.
HARTFORD, CONN. U.S.A.



RUBBER BACK SQUARE PACKING.

BEST IN THE WORLD.

For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

B represents that part of the packing which, when in use, is in contact with the Piston Rod.

A, the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.

This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.

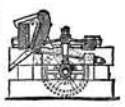
NEW YORK BELTING & PACKING CO.,
JOHN H. CHEEVER, Treas. **Nos. 13 & 15 Park Row, opp. Astor House New York.**

AMERICAN OXIDE BRONZE CO

MAKES THE BEST AND CHEAPEST CAR BOX AND JOURNAL BEARING METAL
TENSILE STRENGTH, 39,292 LBS TO THE SQUARE INCH ELASTICITY 9,718. FOR SALE TO THE TRADE IN INGOTS. THIS METAL CAN BE USED FOR ANY AND ALL PURPOSES. ADDRESS 402 WALNUT ST. PHILADELPHIA

"BLAKE'S CHALLENCE" ROCK BREAKER.

Patented November 18, 1879.



For **Macadam Road** making, Ballasting of **Railroads.** Crushing **Ores,** use of **Iron Furnaces,** etc. Rapidly superseding our *older styles* of Blake Crusher on account of its superior *strength, efficiency,* and *simplicity.* Adopted by important Railway and Mining Corporations, Cities, and Towns. First Class Medals of *Superiority* awarded by American Institute, 1879 and 1880.

BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

THE AJAX METAL Company, PHILA'
CLAMER'S AJAX METALS ESPECIALLY ADAPTED FOR RAILROADS ROLLING MILL & ENGINE BEARINGS, COCKS, VALVES &c

WONDERS MUSICAL OPTICAL
ELECTRICAL, MECHANICAL, &c. FREE
☞ MAMMOTH CATALOGUE
HARBACH ORGANINA CO. Philada. Pa

For removing scale and keeping your boilers clean, use Hanley's Cleaning Composition. J. J. Hanley, Troy, N.Y.

THE DINGEE & CONARD CO'S
BEAUTIFUL EVER-BLOOMING
ROSES

The only establishment making a **SPECIAL BUSINESS of ROSES. 60 LARGE HOUSES for ROSES alone. We GIVE AWAY, in Premiums and Extras,** more **ROSES** than most establishments grow. Strong Pot Plants suitable for immediate bloom delivered safely, postpaid, to any post-office. 5 splendid varieties, **your choice,** all labeled, for **$1;** 12 for **$2;** 19 for **$3;** 26 for **$4;** 35 for **$5;** 75 for **$10;** 100 for **$13.** Our **NEW GUIDE,** *a complete Treatise on the Rose,* 70 pp., *elegantly illustrated* **FREE**

THE DINGEE & CONARD CO.
Rose Growers, **West Grove, Chester Co., Pa.**

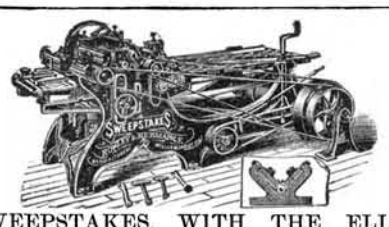
FIRE BRICK TILE AND CLAY RETORTS ALL SHAPES.
BORGNER & O'BRIEN.
23 RD ST. ABOVE RACE, PHILADELPHIA.

More people are poisoned by foul Refrigerators than by sewer gas. Three-fourths of Refrigerators sold breed malaria and fevers, by tainting the food. My **No. 50** House, Hotel and Restaurant Refrigerator will **keep anything** sweet and good. Price **$55** at any R. R. Station in the U. S. Send for Circulars.
B. A. STEVENS, Toledo, Ohio.

FOR SALE, well guarded, pleasant, permanent, thoroughly indorsed, and exceedingly profitable manufacturing business wanted in every city or locality, where Boilers and Engines are used; 24 hours will equip and manufacture goods; one room ten feet square; owner wants no help; no power, very little knowledge of engines and boilers required. Baltimore City not for sale. Entire capital required. $300 to $600. Don't fail to write for circular, STATIONARY AND MARINE, P. O., Baltimore, Md.

SMALL ARTICLES manufactured in wood or metal, on most favorable terms. Patent Office models and experimental machinery a specialty.
E. T. MARTIN, P. O. Box 285, New Brunswick, N. J.

BEFORE YOU BUY A BICYCLE
Of any kind, send stamp to **GUMP BROS., Dayton, Ohio,** for large Illustrated Price List of NEW and SECOND-HAND MACHINES. Second-hand BICYCLES taken in exchange.
BICYCLES Repaired and Nickel Plated.



SWEEPSTAKES, WITH THE ELLIS Patent Journal Box. The best Planer and Matcher ever made. Planing 20 in. wide, 6 in. thick, weight 2,200 lb., $300; planing 24 in. wide, 6 in. thick, weight 2,600 lb., $350. Beading, Arbor, and Head, extra, $20. Sash, Door, and Blind Machinery a specialty. Correspondence solicited. Rowley & Hermance, Williamsport, Pa.

Telegraph and Electrical SUPPLIES

Medical Batteries, Inventors' Models, Experimental Work, and fine brass castings. Send for catalogue **C. E. JONES & BRO. Cincinnati, O.**
It is important to us that you mention this paper.

Syracuse Malleable Iron Works

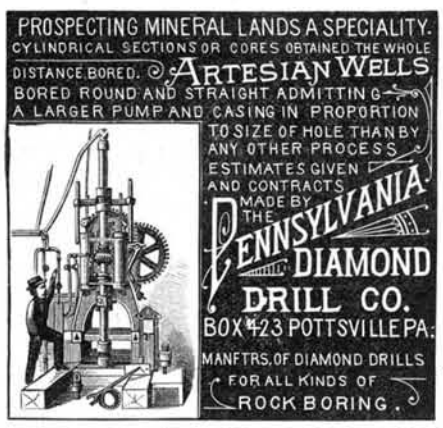
$5 to $20 per day at home. Samples worth $5 free. Address STINSON & Co., Portland, Maine.

SPRAY
FEED WATER
PURIFIER
FOR STEAM BOILERS
U.S. & FOREIGN PATENTS

ORGANS

☞ The Celebrated **York Cottage Organs** are the **BEST** in the world. For sweetness and purity of tone combined with great volume and power, they are unsurpassed. For beauty of style, elegance of finish and artistic workmanship they lead the world. **An Agent Wanted** in every county. We give special prices (very low) to any person who buys the first **York Cottage Organ** in any vicinity where we have no agent. Address
WEAVER ORGAN & PIANO CO.,
Send for Catalogue. **YORK, PA.**

WANTED to correspond with inventors of articles which can be manufactured at small cost. Call upon or address F. J. PATTERSON, Dayton, Ohio.


PROSPECTING MINERAL LANDS A SPECIALITY.
CYLINDRICAL SECTIONS OR CORES OBTAINED THE WHOLE DISTANCE BORED.
ARTESIAN WELLS
BORED ROUND AND STRAIGHT ADMITTING A LARGER PUMP AND CASING IN PROPORTION TO SIZE OF HOLE THAN BY ANY OTHER PROCESS
ESTIMATES GIVEN AND CONTRACTS MADE BY
THE PENNSYLVANIA DIAMOND DRILL CO.
BOX 423 POTTSVILLE PA.
MANFTRS. OF DIAMOND DRILLS FOR ALL KINDS OF ROCK BORING.

PERFECT
NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.
Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN.

ROOT'S NEW IRON BLOWER.

POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED,
Has Fewer Parts than any other Blower.
P. H. & F. M. ROOTS, Manufacturers,
CONNERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 22 Cortland St., 9 Dey St.,
COOKE & CO., Selling Agts., 22 Cortland Street,
JAS. BEGGS & CO., Selling Agts. 9 Dey Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.

INFORMATION
For Users of Steam Pumps.
Van Duzen's Patent Steam Pump
Requires { No Packing or Oil, / No Repairs or Skill, / No Care or Attendance. } Is Reliable.

Can pump any kind of liquid; ever ready; no moving parts; all brass; cannot clog nor get out of order; fully tested; hundreds in daily use; every pump guaranteed; not like cheap Pumps made of Iron; all sizes 4 to 6 inch discharge; prices from $7 upward; capacities from 100 to 20,000 gallons per hour. State for what purpose wanted and send for Catalogue of "Pumps."
VAN DUZEN & TIFT, Cincinnati, O.

ONE HORSE POWER
STEAM-ENGINE
AND BOILER COMPLETE FOR
$100
A PERFECT BOAT ENGINE
SAFE FROM FIRE & EXPLOSION.
NO EXPENSE WHILE ENGINE STOPS.
STEAM IN FIVE MINUTES.
RUNS ITSELF TEN HOURS ON TWO GALLONS OF KEROSENE.
SEND FOR CATALOGUE AND REFERENCES TO
A.H. SHIPMAN ROCHESTER, NEW-YORK.

A Chance for Capitalists.—Right to manufacture the new Wind Engine (page 198 SCI. AM.) in Western States, etc., for sale. Write D. H. BAUSMAN, Lancaster, Pa.

MALLEABLE
AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS
FINE TINNING, JAPANNING AND FINISHING.
THOMAS DEVLIN & CO.
LEHIGH AVE. & AMERICAN ST. PHILA.

THE COMPLETE HOME. Agents wanted for this beautiful book. New edition.—New bindings.—New illustrations from new designs. Superbly gotten up. Same low price. Adapted to all classes. Sells at sight. Agents doing big work. EXCELLENT TERMS. The handsomest prospectus ever issued. Apply now. BRADLEY, GARRETSON & CO., 66 North 4th St., Philadelphia, Pa. Also other grand new books and Bibles.

MICROSCOPES!

TELESCOPES,
FIELD GLASSES,
MAGIC LANTERNS,
BAROMETERS,
THERMOMETERS,
DRAWING INSTRUMENTS,
PHILOSOPHICAL AND CHEMICAL APPARATUS
Send for list and description of our ten Catalogues.
QUEEN & CO., Opticians, **PHILADELPHIA**

I CURE FITS!

When I say cure I do not mean merely to stop them for a time and then have them return again, I mean a radical cure. I have made the disease of FITS, EPILEPSY or FALLING SICKNESS a life-long study. I warrant my remedy to cure the worst cases. Because others have failed is no reason for not now receiving a cure. Send at once for a treatise and a Free Bottle of my infallible remedy. Give Express and Post Office. It costs you nothing for a trial, and I will cure you.
Address Dr. H. G. ROOT, 183 Pearl St., New York.

DYKE'S BEARD ELIXIR
Forces luxuriant Mustache, Whiskers, or hair on bald heads in 20 to 30 days. No injury. Easily used. Beats the world. 2 or 3 Pkgs does the work. Will prove it or forfeit $100.00. Price per Package with directions sealed and postpaid 25 cents, 3 for 50 cts., stamps or silver. **L. A. L. SMITH & CO., Agents, Palatine, Ill.**

NERVOUS DEBILITY in **MEN** quickly cured
FRENCH HOSPITAL METHOD. New to America.
Civiale Remedial Agency, 160 Fulton St., New York

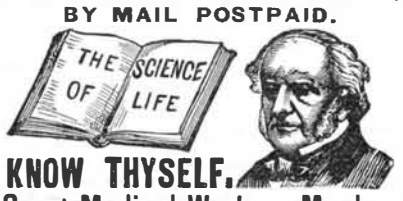
CONSUMPTION.

I have a positive remedy for the above disease; by its use thousands of cases of the worst kind and of long standing have been cured. Indeed, so strong is my faith in its efficacy, that I will send TWO BOTTLES FREE, together with a VALUABLE TREATISE on this disease, to any sufferer. Give Express & P. O. address, DR. T. A. SLOCUM, 181 Pearl St., N. Y.

RUPTURE

cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

266th EDITION. PRICE ONLY $1
BY MAIL POSTPAID.



KNOW THYSELF.
A Great Medical Work on Manhood

Exhausted Vitality, Nervous and Physical Debility, Premature Decline in man, Errors of Youth, and the untold miseries resulting from indiscretions or excesses. A book for every man, young, middle-aged, and old. It contains 125 prescriptions for all acute and chronic diseases, each one of which is invaluable. So found by the author, whose experience for 23 years is such as probably never before fell to the lot of any physician. 300 pages, bound in beautiful French muslin, embossed covers, full gilt, guaranteed to be a finer work in every sense—mechanical, literary, and professional—than any other work sold in this country for $2.50, or the money will be refunded in every instance. Price only $1.00 by mail, postpaid. Illustrative sample, 6 cents. Send now. Gold medal awarded the author by the National Medical Association, to the officers of which he refers.

This book should be read by the young for instruction and by the afflicted for relief. It will benefit all.—*London Lancet.*

There is no member of society to whom this book will not be useful, whether youth, parent, guardian, instructor, or clergyman.—*Argonaut.*

Address the Peabody Medical Institute, or Dr. W. H. Parker, No. 4 Bulfinch Street, Boston, Mass., who may be consulted on all diseases requiring skill and experience. Chronic and obstinate diseases that baffled the skill of all other physicians a specialty. Such treated successfully without an instance of failure. **HEAL THYSELF**

© 1884 SCIENTIFIC AMERICAN, INC

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

COLUMBIA BICYCLES AND TRICYCLES.

New Illustrated (36 page) Catalogue, giving full description of these machines. sent for 3 cent stamp.

THE POPE M'F'G CO.,
597 Washington St., Boston, Mass.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveying power long distances. Send for circular.

"CHAMPION" *Locks. all Brass and Bronze,* Handsome Finish, Durable and Secure Sample Drawer Lock mailed on receipt of 95c. Send 2c. stamp for 12 pp. Illus. Price List showing best Locks for **Drawers, Closets, Desks,** and **Chests** extant. Also a *line* of "Combination" Dial Locks for same purposes at $1.25 to $2.50 *retail.*
MILLER LOCK CO., Philadelphia, Pa

Emerson's New Book of SAWS

More than 100 illustrations, 112 pages. Every rule given that will enable its Readers to overcome every difficulty, and Sawyers instructed in hanging, truing, Or straightening and running all kinds of Never failing of success. Now ready for 'Send your full address to

A 50,000 New Edition for 1884 W SAWS

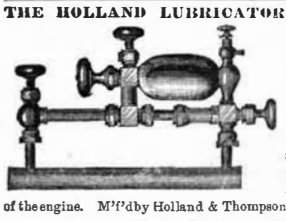
[FREE distribution.
Emerson, Smith & Co., Beaver Falls, Pa.

THE ONLY PRACTICAL THE ELECTRO-DYNAMIC Co. MOTORS Electric OF PHILADA. PA. For Family Sewing Machines. 224 CARTER ST. Send Stamp for Cat.

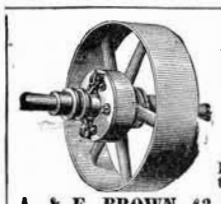
Double Screw, Parallel, Leg Vises.

Made and WARRANTED *stronger* than any other Vise by **EAGLE ANVIL WORKS** only, **Trenton, N. J.**

THE HOLLAND LUBRICATOR, VISIBLE DROP



Is guaranteed to be
1. A perfect insurance against the cutting of Valve-seats, Cylinder and Governor Valves of the engine.
2. It will pay for itself in six months, in the saving of oil, coal, and packing.
3. It will insure more speed in the revolutions of the engine, say from one to two strokes per minute, thus increasing the power of the engine. M'f'd by Holland & Thompson, 217 River St., Troy, N. Y.



F. Brown's Patent
FRICTION CLUTCH.

Send for Illustrated Catalogue and Discount Sheet to
A. & F. BROWN, 43 Park Place, New York.

SHAFTS PULLEYS HANGERS

WATCHMAKERS.

Before buying, see the Whitcomb Lathe and the Webster Foot Wheel. made by the AMERICAN WATCH TOOL CO., Waltham, Mass.

H.W.JOHNS' ASBESTOS

ASBESTOS ROPE PACKING,
ASBESTOS WICK PACKING.
ASBESTOS FLAT PACKING,
ASBESTOS SHEATHINGS,
ASBESTOS GASKETS.
ASBESTOS BUILDING FELT.
Made of strictly pure Asbestos.

H. W. JOHNS M'F'G CO.,

87 Maiden Lane, New York,
Sole Manufacturers of H.W. Johns' Genuine
ASBESTOS LIQUID PAINTS, ROOF PAINTS, ROOFING, STEAM PIPE AND BOILER COVERINGS, FIREPROOF COATINGS, CEMENTS, ETC.
Descriptive price lists and samples free.

WM. A. HARRIS,
Providence, R. I. (Park St.), Six minutes' walk West from station.
Original and Only Builder of the
HARRIS-CORLISS ENGINE,
With Harris' Pat. Improvements, from 10 to 1,000 H. P.
Send for copy Engineer's and Steam User's Manual. By J. W. Hill, M.E. Price $1.25.

The "MONITOR."

A NEW LIFTING AND NON-LIFTING INJECTOR.

Best Boiler Feeder in the world. Greatest Range yet obtained. Does not Break under Sudden Changes of Steam Pressure.

Also Patent
EJECTORS
OR
Water Elevators.
For Conveying Water and Liquid. Patent Oilers, Lubricators, etc.

NATHAN MANUFACTURING COMPANY,
Send for catalogue. **92 & 94 Liberty St., New York.**

JENKINS' PATENT VALVES,

Gate, Globe, Angle, Check, and Safety.
MANUFACTURED OF THE BEST STEAM METAL.

Are the acknowledged standard ... Have been in use since 1868, under all possible conditions, and never have failed.
To avoid imposition, all genuine Valves are stamped "Jenkins Bros."

JENKINS BROS.,
71 John Street, New York. Send for Price List "A." **79 Kilby Street, Boston.**

James Boyd, Philadelphia, Pa.
Rees, Shook & Co., Pittsburg, Pa.
Gibson & Clark, Cincinnati, Ohio.
Chafer & Becker, Cleveland, Ohio.
Dunham, Carrigan & Co., San Francisco, Cal.
AGENTS:
... Ryan, Louisville, Ky.
... Son, Detroit, Mich.
Weir & Co., Chicago, Ill.
Pond Engineering Co., St. Louis, Mo.
Marinette Iron W'k's Co., Chicago, Ill.
Brand & Reichard, Minneapolis, Minn.
English Brothers, Kansas City, Mo.
Hendrie & Bolthoff M'f'g Co., Denver, Col.

American Bell Tele. Co. Patent Dep't. Phone 2 11 Dreyer - 1884

MOSS' NEW PROCESS. SUPERIOR TO ANY OTHER METHOD.

MOSS ENGRAVING CO.

535 PEARL STREET · NEW YORK.

ENGRAVINGS FOR BOOKS, News Papers, Catalogues &c. LARGEST Establishment of the kind IN THE WORLD. FIFTEEN YEARS PRACTICAL EXPERIENCE. SEND STAMP FOR ILLUSTRATED CIRCULAR.

SEND COPY (PHOTOGRAPH, SKETCH OR PRINT) FOR ESTIMATE.

Truss Hoop Driving.

BARREL, KEG,

Hogshead,
AND
STAVE MACHINERY.
Over 50 varieties manufactured by
E. & B. Holmes,
BUFFALO, N. Y.

THE CHEAPEST AND BEST. PHOTO ENGRAVING Co. 67 Park Place NEW YORK ENGRAVING FOR ALL ILLUSTRATIVE AND ADVERTISING PURPOSES.

BOOKS ON BUILDING, PAINTING,

Decorating, etc. For 1883 eighty-eight page illustrated Catalogue, address. Inclosing three 3-cent stamps, WM. T. COMSTOCK, 6 Astor Place, New York.

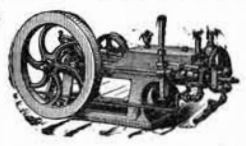
METALLIC SHINGLES

Greatly Reduced in Prices.
$5.50 AND $6.50 PER SQUARE.
NEW AND IMPROVED DESIGNS.
ANGLO-AMERICAN CO.,
22 Cliff Street, New York.

BIG PAY to sell our Rubber Printing Stamps. Sample. free. TAYLOR BROS. & CO., Cleveland, Ohio

SAVE THE FLOORS.
NOISELESS RUBBER WHEELS,
FOR ALL PURPOSES.
GEO. P. CLARK,
WINDSOR LOCKS, CT.

Gas Engines, ½ & 1 H. P., Now Ready.



For Power OR For Pumping

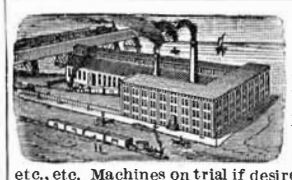
GAS ENGINES.

Simple, Substantial, Safe, Economical.
Half horse power will pump 500 gallons of water 100 feet high per hour with 25 feet of gas.
POWER DETERMINED BY ACTUAL TEST.
Call and see them, or for circulars and prices address
THE CONTINENTAL GAS ENGINE CO.,
No. 231 BROADWAY, NEW YORK

H. A. ROGERS
RAILWAY & MACHINISTS
SUPPLIES.
No 19 JOHN ST. NEW YORK

SHEPARD'S CELEBRATED
$60
Screw Cutting Foot Lathe.

Foot and Power Lathes, Drill Presses, Scrolls, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs. Calipers. etc. Send for catalogue of outfits for amateurs or artisans. Address
H. L. SHEPARD & CO.,
341 & 343 West Front St., Cincinnati, O.



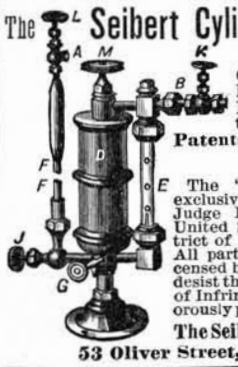
BARNES'

Patent Foot and Steam Power Machinery. Complete outfits for Actual Workshop Business. Lathes for Wood or Metal. Circular Saws, Scrool Saws, Formers, Mortisers. Tenoners, etc., etc. Machines on trial if desired. Descriptive Catalogue and Price List Free. **W. F. & JOHN BARNES, No. 1999 Main St., Rockford, Ill.**

WATER.

Cities, Towns, and Manufactories
Supplied by GREEN & SHAW
PATENT TUBE AND GANG WELL SYSTEM.
Wm. D. Andrews & Bro., 233 Broadway, N. Y.
Infringers of above patents will be prosecuted.

The Seibert Cylinder Oil Cup Co.,

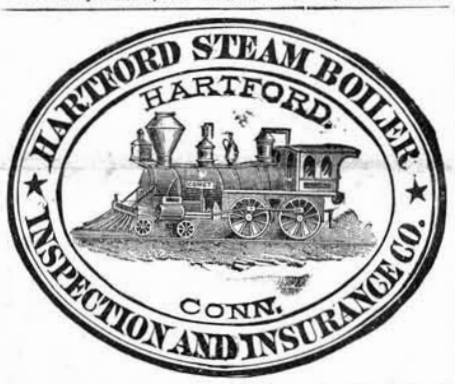


Manufacturers of **Oil Cups for Locomotive, Marine and Stationary Engine Cylinders,** under the **Seibert** and **Gates Patents, with Sight Feed.**

TAKE NOTICE.
The "Sight Feed" is owned exclusively by this company. See Judge Lowell's decision in the United States Circuit Court. District of Massachusetts, Feb. 23, '82. All parties, except those duly licensed by us, are hereby notified to desist the use, manufacture, or sale of Infringing Cups, as we shall vigorously pursue all infringers.

The Seibert Cylinder Oil Cup Co.,
53 Oliver Street, Boston, Mass.

50 NEW all gold motto and hand Chromo Cards, no 2 alike, name on; 10 cents, 13 packs $1.00. Agent's sample book, 25c. L. JONES & CO., Nassau, N. Y.



Van Duzen's Pat. Loose Pulley Oiler
HAS Highest Indorsements, Enviable Reputation, Scientific Pedigree.
A two years' test by conservative manufacturers of national reputation has shown it to be the *only perfect Lubricator for Loose Pulleys* in use. Prices very reasonable. Send for our "Catalogue Number 55."
VAN DUZEN & TIFT, Cincinnati, O

SHINGLE MACHINERY.

Send for our circulars containing price lists of our improved Shingle Machinery. Over one-half of the shingles manufactured in the Northwest are manufactured on the Challoner Patent Shingle Machinery.
GEO. CHALLONER'S SONS, Omro, Wis.

The Rider Hot Air COMPRESSION PUMPING ENGINE

IMPROVED.
For Residences or Institutions.
Absolutely Safe.
Any house servant can run it. Has a record of nine years. Send for "catalogue E."
SAYER & CO., 19 DEY ST.
After May 1st, 1884, 34 Dey Street, New York.

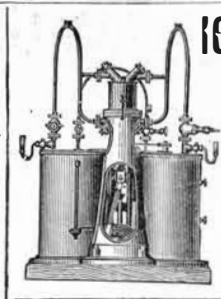
PIPE COVERING.

Fireproof Non-conducting Coverings for Steam Pipes, Boilers, and all hot surfaces. Made in sections three feet long. Easy to apply. **Asbestos Materials—Fiber, Millboard Packing, and Cement.**
CHALMERS-SPENCE CO.
419-421 Eighth St., New York.

BOOKWALTER ENGINE.
Compact, Substantial, Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of

3	HORSE POWER.....	$240 00
4½	" "	280 00
6½	" "	355 00
8½	" "	440 00

Put on cars at Springfield, O.
JAMES LEFFEL & CO., Springfield, Ohio,
or 110 Liberty St., New York.

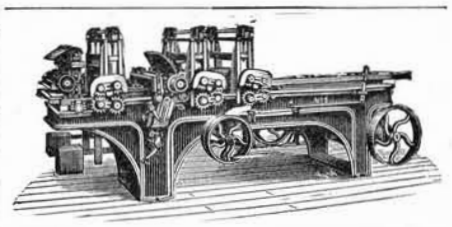


ICE MACHINES

Of all sizes, from
10 lb. per Hour to 50 Tons per Day
Binary Absorption System.
ECONOMICAL, SIMPLE, RELIABLE.
Send for Circulars.
Delamater Iron Works,
16 Cortlandt St.,
NEW YORK, U. S. A.

SOUTHWARK FOUNDRY & MACHINE COMPANY,
430 Washington Avenue, Philadelphia,
Engineers & Machinists,

Blowing Engines and Hydraulic Machinery.
Sole makers of the
Porter-Allen Automatic Cut-Off Steam Engine.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

SPEAKING TELEPHONES.

THE AMERICAN BELL TELEPHONE COMPANY,
W. H. FORBES, *President.* W. R. DRIVER, *Treasurer.* THEO. N. VAIL, *Gen. Manager.*

Alexander Graham Bell's patent of March 7, 1876, owned by this company, covers every form of apparatus, including Microphones or Carbon Telephones, in which the voice of the speaker causes electric undulations corresponding to the words spoken, and which articulations produce similar articulate sounds at the receiver. The Commissioner of Patents and the U. S. Circuit Court have decided this to be the true meaning of his claim; the validity of the patent has been sustained in the Circuit on final hearing in a contested case, and many injunctions and final decrees have been obtained on them.

This company also owns and controls all the other telephonic inventions of Bell, Edison, Berliner, Gray, Blake. Phelps, Watson. and others.

(Descriptive catalogues forwarded on application.)

Telephones for Private Line, Club, and Social systems can be procured directly or through the authorized agents of the company.

All telephones obtained except from this company, or its authorized licensees, are infringements, and the makers, sellers, and users will be proceeded against

Information furnished upon application.

Address all communications to the
AMERICAN BELL TELEPHONE COMPANY,
95 Milk Street, Boston, Mass.

PROSPECTUS

OF THE
Scientific American
FOR 1884.

The Most Popular Scientific Paper in the World.

Only $3.20 a Year, including postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly **illustrated** paper is published weekly. Every number contains **sixteen** pages of useful information, and a large **number of** original engravings of new inventions and **discoveries,** representing Engineering Works, Steam **Machinery,** New Inventions, Novelties in Mechanics, **Manufactures,** Chemistry, Electricity, Telegraphy, Photography, **Architecture,** Agriculture, Horticulture, Natural **History, etc.**

All Classes of Readers find in the SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; six months, $1.60; three months, $1.00.

Clubs.—**One extra copy** of the SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.20 each; additional copies at same proportionate rate.

One copy of the SCIENTIFIC AMERICAN and one copy of the SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of *seven dollars* by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
361 Broadway New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, one year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for one year. This includes postage, which we pay. Remit by postal order or draft to order of
MUNN & CO., 361 Broadway, New York.

PRINTING INKS.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts. Phila., and 47 Rose St., opp. Duane St., N. Y.

© 1884 SCIENTIFIC AMERICAN, INC